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The Directors and Senior Researchers:

Prof G West
Dr P Lam



Co-Directors:

Prof P Lee
Prof S Venkatesh



"The Team"

Software for the Process Industry

Funding has been obtained to establish the Centre for Intelligent Process Operations Management (iPOM) to develop software for process industries, including the minerals industry. iPOM is conducting high-quality research in the inter-disciplinary area of intelligent process operations management which tackles the complex task of maintaining safe and economic operation of various interlinked sub-processes in the minerals industry.

iPOM's collaborators include the Gensym Corporation, Western Power, Alcoa of Australia Limited and BP Kwinana.

The Centre results in the marriage of two disciplines, computing and process control. The partnership combines the skills necessary to resolve a well-recognised high-level industrial control problem that has evaded solution. A major problem is making sense and assigning cause to variations in plant data. Once this has been cracked, an array of dependent problems will be amenable to solution and refinement.

The Centre is devoted to applied research. The products and services arising from the work of the Centre will be channelled for commercialisation through a variety of mechanisms.

Focus

Through existing industry collaboration, the focus of iPOM is in **intelligent alarm management**. This area offers the potential to capture significant economic benefit for the process industries. This research involves developing intelligent alarm management tools for providing the following capabilities:

- Analysis and presentation of alarm data.
- Minimisation of the number of nuisance, standing or repeating alarms (repeating alarms account for 50% of alarms).
- Prioritisation of control problems and aid process operators in carrying out the remedial actions.

Staff of the Centre

Directors

- Professor Peter Lee - Process Operations
- Professor Svetha Venkatesh - Pattern Recognition

Senior Project Staff

- Dr Peng Lam - Project Leader, Pattern Recognition
- Professor Geoff West - Pattern Recognition
- Dr S Shastri - Process Operations
- Dr S Greenhill - Project Manager

Project Staff:

- James Ko - Research Officer
- Kheng Teo - Research Officer

Funding: W.A. State Government Grant 2001-2003 \$1,033,671

We are developing new techniques and algorithms that we expect will have a major impact on these areas over the next several years. The algorithm that achieves this has potential application both to data compression and computational biology. In 2002 we will publish a series of papers that show how to compute repeating substrings with time and space efficiency, greatly improved over existing methods. We expect these new algorithms to be particularly useful for data compression, an area to which we have already started to contribute. Also in 2002 we will be submitting another series of papers that describe properties of a new class of strings whose repetitions can be computed in linear time.

Members



Prof C Iiopoulos



Prof W F Smyth



Dr Andrew Turpin

Current Research Projects

Algorithms for String Processing

Prof C S Iliopoulos and Prof W F Smyth

This research has focused on identifying various kinds of patterns, especially various kinds of 'approximate periodicity' in strings; much of it turns out to bear directly on problems that arise in computational biology.

A string is a concatenation of elements, called letters, drawn from an identified set, called the alphabet. The letters can be ordered or not, and the alphabet can be finite or not. In biological applications, the DNA alphabet $A = \{c,g,a,t\}$ of cardinality 4 and the protein alphabet of cardinality 20 are most common: $z = ccgattcgacgat$ is an example of a string on A . Properties of strings have been studied by mathematicians throughout the 20th century, but it was only with the advent of computer science as a discipline that attention shifted to algorithms on strings. The initial focus of these algorithms was the location of fixed patterns in strings; for example, of $cgat$ or tcg in the DNA string z given above. The most notable such 'pattern-matching' algorithms have given rise to dozens of descendant/hybrid algorithms over the last 20 years. These algorithms, modified to accommodate 'don't-care' letters, continue to have application to DNA/protein problems.

In the 1980s however, in response to requirements arising out of a variety of applications, interest arose in algorithms for finding repetitions in strings; that is, equal adjacent substrings such as cc or $cgacga$ in z . Three optimally efficient algorithms were discovered in short order. This success, together with the fact that in practice it was often desirable to relax the meaning of 'repetition', has led more recently to the study of a collection of related patterns ('weak repetitions', 'covers', 'seeds') which we say exhibit approximate periodicity. Of particular importance is the idea of a cover: a set U of strings is said to cover a given string x if and only if every position in x is included in an instance of some string of U . Much of the investigators' recent work has focused on approximate periodicity and algorithms to identify it. There has also been substantial work done on issues arising out of these algorithms: on the computation of 'distinct' strings and on Sturmian strings which constitute worst cases for almost all of the algorithms.

Compute All Repetitions

Assoc Prof C S Iliopoulos and Prof W F Smyth

Building on previous work done in this area, team members have devised a new algorithm that will for the first time permit all the "nonextendible" repeating substrings of a given string to be computed efficiently. Furthermore, these repetitions can be presented in space that is linear in string length. This is a major breakthrough in an area that has been heavily researched for 20 years.

Data Compression Algorithms

Assoc Prof C S Iliopoulos, Prof W F Smyth, Dr A Turpin

As an immediate consequence of being able to efficiently compute all the repetitions in a string, it becomes possible to design data compression schemes that take account of global patterns in a long string rather than just local ones. This should lead to substantial improvement on current data compression techniques such as Ziv-Lempel and its variants, and offline data compression algorithms.

Analysis of Musical Texts

Assoc Prof C S Iliopoulos, Prof S Venkatesh and Dr M Kumar

Work done on string covering problems has immediate application to this important interdisciplinary area: in future, it will be possible to establish musical databases in such a way that repeated motifs can be located efficiently, both within a given score and over many scores.

Linear-Time Reporting of Repetitions

Assoc Prof R J Simpson and Prof W F Smyth

Using insights gained from previous work done by the team members on special strings, techniques are being developed that are expected to permit linear-time reporting of repetitions. This will have immediate application both to computational biology and data compression.

String Complexity

Prof C S Iliopoulos, Assoc Prof R J Simpson and Prof W F Smyth

This fundamental theoretical work arises out of previous work done by team members: it has become clear that for strings of low complexity, the repetitions can be computed in linear time, even though such strings generally contain large numbers of repetitions. The apparent paradox is resolved by the device of computing "runs" rather than repetitions. In 2001 three papers were written that introduced a new class of strings called "two-pattern" strings, and that show how to compute the runs in such strings in linear time. Further work in this area will be submitted for publication in 2002.

Publications

Book

Moffat, A. and **Turpin, A.** (2002)
Compression and Coding Algorithms, Kluwer Academic Publishers.

Journal Articles

Smyth, W.F. (2000)
Repetitive perhaps, but certainly not boring, TCS, Vol 249, No 2, pp 343-355.

Franek, F., Karaman, A. and **Smyth, W.F.** (2000)
Repetitions in Sturmian strings, TCS, Vol 249, No 2, pp 289-303.

Sim, S., **Iliopoulos, C.S.**, Park, K. and **Smyth, W.F.** (2001)
Approximate periods of strings. Theoretical Computer Science, 262, pp 557-568.

Franek, F., Lu, W. and **Smyth, W.F.** (2001)
Repetitions in two-pattern strings, 5th World Multiconference on Systemics, Cybernetics & Informatics, Vol 7, pp 132-135.

Li, Y. and **Smyth, W.F.** (2002)
Computing the cover array in linear time, Algorithmica, Vol 32, No 1, pp 95-106.

Franek, F., Gao, S., Lu, W., Ryan, P.J., **Smyth, W.F.**, Sun, Y. and Yang, L. (2002)
Verifying a border array in linear time, Journal on Combinatorial Mathematics & Combinatorial Computing, Vol 42, pp 223-236.

Iliopoulos, C.S., Miller, M. and **Smyth, W.F.** (2002)
International Journal of Computer Mathematics, pp 79-12, Special Issue on Combinatorial Algorithms.

Smyth, W.F. (In Press)
Computing Patterns in Strings, Addison Wesley Longman (UK)

Smyth, W.F. (In Press)
Fundamenta Informaticae, Special Issue on Computing Patterns in Strings.

Franek, F., Lu, W. and **Smyth, W.F.** (In Press)
Two-pattern strings - a recognition algorithm, Discrete Algorithms.

Holub, J. and **Smyth, W.F.** (In Press)
Algorithms on indeterminate strings.

Simpson, R.J. and **Smyth, W.F.** (In Press)
The maximum number of runs in a string.

Franek, F., **Smyth, W.F.**, Xiao, X. and Holub, J. (In Press)
Computing quasi suffix arrays.

Iliopoulos, C.S., Mohaman, M., Mouchart, L., Perdikuri, K.J., **Smyth, W.F.** and Tsakalidis, A.K. (In Press)
String regularities with don't cares, Nordic Journal of Computing.

Franek, F., **Smyth, W.F.** and Tang, Y. (In Press)
Computing all repeats using suffix arrays.

Franek, F., **Smyth, W.F.** and Xiao, X. (In Press)
A note on Crochemore's repetitions algorithm - a fast space-efficient approach, Nordic Journal of Computing.

Chen, X., Lam, C.P. and **Smyth, W.F.** (In Press)
Retrieval by spatial configuration.

Koh, K.M., Miller, M., **Smyth, W.F.** and Yen, W. (In Press)
On optimum summable graphs.

Conference Proceedings

Franek, F., Lu, W., and **Smyth, W.F.** (2001)
Repetitions in Two-Pattern Strings, Proc. Fifth World Multiconference on Systemics, Cybernetics & Informatics, Volume VII. pp132-135.

Iliopoulos, C., Kumar, M., Mouchard, L. and **Venkatesh, S.** (2000)
Motif Evolution in Polyphonic Musical Sequences. 11th Australasian Workshop on Combinatorial Algorithms, Newcastle, Australia, pp 53-66.

Franek, F., Jiang, J., Lu, W. and **Smyth, W.F.** (2002)
Two-pattern strings, 13th Annual Symposium on Combinatorial Pattern Matching, Apostolico, A. and Takeda, M., Eds, pp 76-84.

Baghdadi, L., Franek, F., **Smyth, W.F.** and Xiao, X. (2002)
Computing quasi suffix arrays (preliminary version), 13th Australasian Workshop on Combinatorial Algorithms, Billington, E., Donovan, D., and Khodkar, K., Eds., pp 278-296.

Franek, F., **Smyth, W.F.** and Tang, Y. (2002)
Computing all repeats using suffix arrays (preliminary version), 13th Australasian Workshop on Combinatorial Algorithms, Billington, E., Donovan, D. and Khodkar, A., Eds., pp 171-184.

Iliopoulos, C.S., Mohamed, M., Mouchard, L., Perdikuri, K.J., **Smyth, W.F.** and Tsakalidis, A.K. (2002)
String regularities with don't cares (preliminary version), Prague Stringology Conference '02, Balik, M., and Simanek, M., Eds., pp 65-74.

Franek, F., **Smyth, W.F.** and Xiao, X. (2002)
A note on Crochemore's repetitions algorithm - a fast space-efficient approach (preliminary version), Prague Stringology Conference '02, Balik, M. and Simanek, M., Eds., pp 36-43.

Turpin, A. and **Smyth, W.F.** (2002)
An approach to phrase selection for offline data compression, 25th Australasian Computer Science Conference, Oudshoorn, M., Eds., pp 267-273.

Franek, F., Lu, W. and **Smyth, W.F.** (2001)
Repetitions in two-pattern strings, 5th World Multiconference on Systemics, Cybernetics & Informatics, Vol 7, pp 132-135.

Seminars & Invited Talks

Assoc Prof Bill Smyth

Co-editor of a special issue of the Journal of Discrete Algorithms (2001)

Editor of special issue of Fundamenta Informaticae

Members



Prof S Venkatesh



Prof G West



Dr W Q Lui



Dr H H Bui



Dr M Lazarescu



Dr S Greenhill

The artificial and machine intelligence group have well focused areas of research involving theoretical and practical aspects. The main focus is on techniques for multi-dimensional data analysis including video, sound, 3D intensity and range data, and complex spatial patterns.

Much of this work is in the areas of large scale pattern recognition and machine learning for image and video interpretation and query systems.

Three main areas of applications are the large scale surveillance systems, content management systems and the construction of a SMART home for the aged.

The work is mainly funded by the state and federal governments (ARC, CSIRO, DSTO) and industrial sources. Sponsorship from all these sources has increased in value and a future objective is to attract more industrial contracts.

Current Research Projects

Verification and Feature Performance

Prof G West

Object recognition can be regarded as consisting of two stages: indexing and verification. Indexing analyses features and produces one or more hypotheses about the objects. Verification tests each of these hypotheses reducing the number to ideally one. This project is concerned with analysing the usefulness of different features for verification using different match metrics. A major goal is to develop objective measures that can be used to design recognition systems.

Detecting and Analysing Patterns of Human Behaviour from Image Sequences

Prof S Venkatesh, Prof G West and Dr R Hosie (Harvest Road)

There is a desire in surveillance of public and private areas for systems to trigger alarms when something unusual occurs such as a medical emergency, robbery etc. We have implemented a flexible system that can classify a set of movements exhibited by pairs and groups of targets. By characterising and learning a small set of simple general movements between pairs of targets, we characterize complex movements in terms of sequences of these primitive behaviours. The benefit of the system is that a small set of symbols and rules can be used to detect complex behaviour over different time periods and numbers of people.

Content Based Image Retrieval

Prof S Venkatesh, Miss H Raman,
Dr K Shearer and Dr Peng Lam (Murdoch University)

This project looks at the issues of image retrieval from image databases. We address the problem by answering the question "Find me an image that looks like these ones". In the first stage the system analyses the aspects of similarity in the given image and then uses these aspects for retrieval from the database.

Negotiating Between Intelligent Agents

Prof S Venkatesh, Dr D Kieronska, and Dr H Bui

This project examines the issues that are central to negotiation between software agents. The project aims to devise formalisms and appropriate algorithms for software agents to resolve conflicts co-operatively when trying to achieve common goals.

Funding: Overseas Postgraduate Research Scholarship

Generating CAD Descriptions from Range Data

Prof G West, Dr M Robey, Dr J Ivins, Mr A Loh, and Mr K Ijimo

This large project is concerned with the building of CAD models (either CSG trees or Breps) from range and intensity data. Currently range data is segmented into features (surface patches) using a number of techniques and then into 3D features. Issues include how to segment the range data (curvature, covariance, model fitting) and the use of intensity and other data sources to clean up the results and remove ambiguities.

Funding: Large ARC: 1998-2000 \$167,000

Intelligent Inspection by Autonomous Programs Ensemble (APE)

Prof G West, Prof S Venkatesh and Dr M Takatsuka

The inspection task, which checks local and global validity between a blueprint and the corresponding sensed data, can have at least three types of tasks. The first task is to interpret the blueprint and find the corresponding sensed data.

The second task is to analyze sensed data and find the corresponding blueprints. The last task is to find both blueprints and sensed data from the generic description of them - such as symbolic representation of objects. The main aim of this project is to develop an intelligent inspection system, which can handle those three different inspection tasks, using distributed artificial intelligence technology and machine learning.

Funding: Large ARC 1997-1999 \$156,000

Actions and Events in Dynamic Environments: Flight Mission Modelling

Prof T Caelli, Dr A R Pearce and Dr S Goss (Aeronautical and Maritime Research Laboratories, DSTO)

This project involves the interpretation of actions and events in dynamic domains. This includes the recognition and description of aeroplane manoeuvres and pilot intentionality in agent-oriented flight mission modelling. One of the aims of this work is to bind descriptions to the spatio-temporal "trajectories" present in time-series output. In particular, the support of relational queries for agent-oriented procedural reasoning systems, this includes the belief, desires and intentionality (BDI) planning model. The approach involves supporting queries, automatic descriptions and or predictions from spatio-temporal action sequences those of states and their continuous valued, attributed relationships (the scenery) and actions (the scenario). For example in describing flight, an approach to land manoeuvre is defined by the subsequence of different roll–pitch yaw states of the aeroplane and different actions on the control yoke. Relational learning techniques such as decision trees and inductive logic programming are utilised and adapted to the constraints present in time series data. A relational evidence framework and dynamic programming are used to achieve realtime interpretation.

Funding: Aeronautical and Maritime Research Laboratories, DSTO (\$100,000: 1997-1998)

Spatio-temporal Pattern Retrieval from Large Databases

Prof S Venkatesh, Dr A Pearce and Dr L Narasimhan (DSTO partners: Information Technology Division)

This project is in conjunction with the Information Technology Division of DSTO (Defence Science & Technology Organisation). It seeks to retrieve patterns of interest from a database of spatio-temporal patterns, and develop classification procedures for spatio-temporal patterns, enabling the development of efficient tools for threat indicators and situation assessment.

The project seeks to develop methodologies for multimedia processing with particular emphasis on video and image processing from large databases with temporal attributes.

Funding: 1998-1999 \$40,000 (DSTO) \$40,000 (Curtin)

Development of a Situation Assessment Tool for Submarines

Prof S Venkatesh, Dr A Pearce and Dr S Greenhill

This project is in conjunction with the Maritime Operations Division (MOD) of DSTO (Defence Science and Technology Organisation) and seeks to develop a system that can recognise situations experienced in submarine domain, develop a situation assessment processor to recognise a situation in tactical simulation and generate a description in human readable form. It will develop a language to describe spatio-temporal situations in a submarine domain, develop a situation assessment processor to recognise a situation in tactical simulation and generate a description in human readable form. Graphical tools for describing the situation using the formal specifications will also be developed.

Funding: DSTO 1998-2001 \$200,000

The Balanced Realization and Identification Techniques for Singular Systems and their Applications

(Dr W Q Liu)

In this five year project, two important issues for singular systems will be tackled: Balanced Realization and Identification. Many important problems will be investigated around these two issues, such as balanced realization algorithms, model reduction issue, characterization of impulsive outputs and initial jumps. Several new concepts will be proposed and some existing gaps in the study of singular systems will be filled.

Funding: ARC 1999-2004 \$260,000

A Unified Approach to Singular Systems Control Design

(Dr W Q Liu)

This project is intended to characterize singular systems from the information point of view and this will put many control problems into one framework structure. Also the impulsive feature will be given new interpretations in this structure.

Funding: ARC 2000 \$14,000

Human Vision Meets Machine Vision for Real-World Object and Pattern Recognition

Prof I Rentschler, Dr M Juttner, Dr A Pearce and Mr E Osman

This project involves modelling human object recognition and investigating the significance of different kinds of representations used. The present discussion about the quality of mental representations of spatial objects is mainly determined by two positions. The assumption of an object-centred three-dimensional (3D) representation on the one hand, versus the model of viewer-centred representation in the form of multiple two-dimensional (2D) views on the other. On a simple object recognition task the dependency of learning time and ability for spatial generalisation of human observers on previous knowledge is investigated. The subjects are trained using a supervised learning paradigm and different degrees and types of previous knowledge used. The performance of human subjects is modelled using machine learning methods. Especially useful is a recognition by parts technique, used for machine matching, which combines graph matching methods with relational evidence theory. Use of a matching algorithm, CLARET, allows the investigation of the importance of relationships and features used in building prototypic descriptions of objects. It provides a computational model, which allows for detailed analysis and predictions. Applications include clinical diagnosis of visual perception disturbances and modelling brain function.

Funding: German Research Council (DFG) 1998-1999.

Layered Dynamic Probabilistic Networks for Spatio-temporal Modelling

Prof S Venkatesh, Prof G West and Dr H H Bui

In applications such as tracking and surveillance in a large spatial environment, there is a need for representing dynamic and noisy data and at the same time dealing with them at different levels of detail. In the spatial domain, there has been work dealing with these two issues separately, however, there is no existing common framework for dealing with both of them. We propose a new representation framework called Layered Dynamic Probabilistic Network (LDPN), a special type of Dynamic Probabilistic Network (DPN) capable of handling uncertainty and representing spatial data at various levels of detail. The framework is thus particularly suited to applications in wide-area environments, which are characterised by large region size, complex spatial layered multiple sensors/cameras. To avoid the problem of a relatively large state space associated with a large spatial environment the LDPN explicitly encodes the hierarchy of connected spatial locations, making it scalable to the size of the environment being modelled. There are three main advantages of the LDPN: the reduction in state space makes it suitable for dealing with wide area surveillance involving multiple sensors. Second, it offers a hierarchy of intervals for indexing temporal data, a feature that is not present in other Bayesian representations. Lastly, the explicate representation of intermediate sub-goals allows for the extension of the framework to easily represent group interactions by allowing coupling between sub-goal layers of different individuals or objects. We describe an adaption of the likelihood sampling inference scheme for the LDPN, and illustrate its use in a surveillance scenario.

Funding: Large ARC 1998-2000 \$180,000

Semantic compression: Using Accelerometers to Recognise Complex Human Gestures for Video Annotation and Event Detection

Prof S Venkatesh, Prof G West, Dr H Bui, Dr S Smith

The latest developments in video-on-demand and the desire for customised content delivery has unearthed the new issue of semantic compression that seeks to label video with events about objects and scene content. We aim to use accelerometers worn by sports officials to augment video annotation and interpret the signals such that the video broadcast can be annotated by timestamped officials' gestures. The significance lies in the use of non-visual sensors in a novel probabilistic framework required to detect the rich and complex gestures to detect the sport highlights. Outcomes and deliverables will be methods, software tools and techniques to annotate non-visual sensors.

Funding: Large ARC 2001-2003 \$167,000

The Inverse Spielberg Problem: Extracting Elements of Visual Grammar from Video for Synthesis, Training, and Retrieval Applications

Prof S Venkatesh, Dr C Dorai (IBM T J Watson Research Center), B Adams, B Truong, and S Moncrieff.

This project will develop a computational scheme to analyse and understand the grammar that underlies the film language. It aims to discover the cinematic elements of visual presentation from the basic elements of visual grammar namely, the shot, the movement, the recording distances, and the rules of combination that are commonly followed during the visual narration of a story. In particular we aim to identify and extract computable features from video sequences that will identify aspects of film techniques such as camera work, lighting, sound recording, editing, and the use of iconography. Further, we aim to learn patterns and rules of associations in primitive and higher order features with the primary aim of data-mining for film "idioms."

Funding: Large ARC 2000-2002 \$173,700

Layered Dynamic Probabilistic Networks for Co-ordination of Multiple Sensors

Prof S Venkatesh, Prof G West, Mr Nam, Mr M Petrovsky and Dr H Bui

We will investigate techniques to co-ordinate multiple cheap cameras to deal with complex spatial temporal scenarios in wide-area scenes such as for surveillance and outdoor broadcasting. The main issues we address are: Representation of the domain knowledge, i.e. actions and interactions of a group of tracked objects (people in this case). In particular, the representation must encode the inherent spatio-temporal characteristics of the domain, deal with uncertainties of noisy observations and represent coupling of goals and sub-goals to allow for recognition of multi-object actions.

Co-ordination of multiple cameras: each has limited resources, and the problem is for each camera to decide the best course of action (which objects it should track), so that the overall objective of tracking all objects reliably is best satisfied. Recognition of complex multi-object actions: that is, to be able to interpret group behaviour where a group consists of more than one interacting object.

This long term project is concerned with investigating multi-camera computer-based surveillance techniques for wide area scenes such as buildings. It uses the latest technology in image compressing, image processing and computer vision to build low-cost solutions using PCs, cheap cameras and the Linux operating system.

Funding: CISS

Encoding and Compressing Weather Data for Low Data Rate Transmission

Prof S Venkatesh, Prof G West, Mr H Pham

This project aims to develop compression methods to transmit weather information (isobars, text) over low band width links. Considering isobars, minimum description length is used to minimise the number of parameters sent where the number of parameters depends on the order of spline fitting and the number of splines used.

Funding: Terravision MSc Scholarship \$28,000

Three Dimensional Data Structures to Support Boundary and Solid Descriptions of Regions and Objects

Prof G. A. W. West, Dr M. N. Gahegan (Penn State), Dr S. Fox and Mr R. Iverach

The aim of this research project is to develop data structures and associated access and indexing methods mainly to meet the needs of the geo-scientific community. The work is concentrating on the representation of edges and regions in hybrid data structures term edge encoded quadtrees. So far the standard set theoretic operations have been implemented using this data structure. Current work is concentrating on extending the work to volumetric data using face encoded octtrees.

Funding: CSIRO PhD Scholarship \$60,000

Bridging the Semantic Gap for Building Effective Content Management Systems: Computational Media Aesthetics

Prof S Venkatesh

This project focuses on video abstraction and aims to bridge the semantic gap between the simplicity of available visual features and the richness of user descriptions. We examine how visual and aural techniques are brought together to influence the engagement of audience in a story portrayal. The major outcome will be a computational framework for extracting the semantics associated with audiovisual elements in television/film, and scalable software tools that can rapidly and consistently analyse media along various aesthetic dimensions. It will allow for high-level annotation of media and the building of more effective content management systems with enhanced user querying capabilities.

Funding: \$278,000

Publications

Book

Dorai, C. and Venkatesh, S. (2002)

Advances in Media Computing: Computational Media Aesthetics, Kluwer Press.

Book Chapters

Moncrieff, S., Dorai, C. and **Venkatesh, S.** (2001)

Determining Affective events through film audio, Advances in Media Computing: Computational Media Aesthetics, Kluwer Press, pp 131-154.

Shearer, K. and **Venkatesh, S.** (2001)

Rapid Similarity Retrieval from Image and Video, Multimedia Image and Video Processing, Guan, L and Larsen, J., Eds, CRC Press, pp 437-464.

Xu, L., Liu, W.Q. and **Venkatesh, S.** (2002)

A new vector quantization approach via self-organizing map, Journal of Advances In Neural Networks, Grmela, A. and Mastorakis, N.E., Eds, WSEAS Press, pp 147-154.

Adams, B., Dorai, C. and **Venkatesh, S.** (2002)

Formulating Film Tempo, Advances in Media Computing: Computational Media Aesthetics, Kluwer Press, pp 57-79.

Journal Articles

Gao, F., **Liu, W. Q.**, Sreeram, V. and Teo, K. (2000)

Characterization on the global optimal feedback gains for linear time invariant systems, Journal of Optimal Control Applications and Methods, Vol 21, pp 195-209.

Diab, M, **Liu, W. Q.** and V. Sreeram (2000)

Model reduction on linear time invariant systems via gradient flow approach, Journal of Dynamics and Control, pp 255-276.

Lam, P., **West, G.** and **Venkatesh, S.** (2000)

Obtaining functional parametric models using active vision strategies, Pattern Recognition, Vol 34, No 1, pp 79-94.

Greenhill, S. and **Venkatesh S.** (2000)

Semantic data modelling and visualisation using Noetica, Data and Knowledge Engineering, Vol 33, No 2, pp 241-276.

Srinivasan, M., Zhang, S., Chahl, J. Barth, E., **Venkatesh, S.** (2000)

How Honeybees make grazing landings on flat surfaces, Journal of Biological Cybernetics, Vol 83, No 3, pp 171-183.

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Theory of spatiochromatic image encoding and feature extraction, *Journal of the Optical Society of America A: Optics, Image Science, and Vision*, pp 1744-1754.
- Shearer, K., **Venkatesh, S.** and Bunke, H. (2000)
Video sequence matching via decision tree path following, *Pattern Recognition*, Brisbane, Queensland, Australia, pp 602-604.
- Liu, W. Q.** and Sreeram, V. (2001))
Model reduction of singular systems, *International Journal of Systems Science*, Vol 32, No 10, pp1205-1215.
- Liu, W. Q.**, Dong, Z., Zhang, C. and Hill, D. (2001)
Minimum order stable recursive filter design via genetic algorithm approach, *International Journal of System Science*, Vol 32, No 3, pp401-408.
- Dorai, C. and **Venkatesh, S.** (2001)
Computational media aesthetics: Finding meaning beautiful, *IEEE Multimedia*, pp 4-6.
- Shearer, K., **Venkatesh, S.**, Wong, K. (2001)
Combining multiple tracking algorithms for improved general performance, *Journal of Pattern Recognition*, Vol 34, No 6, pp 1257-1269.
- Shearer, K., Bunke, H., **Venkatesh, S.**, (2001)
Video indexing and similarity retrieval by largest common subgraph detection using decision trees, *Journal of Pattern Recognition*, Vol 34, No 5, pp 1075-1091.
- Shearer, K., **Venkatesh, S.** and Bunke, H. (2001)
Video sequence matching via decision tree path following, *Journal of Pattern Recognition*, Vol 34, No 5, pp 1075-1091.
- Takatsuka, M., **West, G. A. W.**, **Venkatesh, S.** & Caelli, T. M. (2001)
Low cost interactive active monocular range finder, *Journal of Machine Vision and applications*.
- Bui, H.**, **Venkatesh S.**, **West, G.** (2001)
Tracking and surveillance in wide area spatial environments using abstract hidden Markov models. Invited paper, *International Journal of Pattern Recognition and Artificial Intelligence*, Vol 15, No 1, pp 177-196.
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Learning about dynamic scenes, *Journal of Spatial Vision*, Vol 13, No 2-3, pp 315-320.
- Lam, P., **West, G.**, and **Venkatesh, S.**, (2001)
Obtaining functional parametric models using active vision strategies, *Journal of Pattern Recognition*, Vol 34, No 1, pp 79-94.
- Rolfe, B., Cardew-Hall, M., Abdalla, M. and **West, G.** (2001)
Geometric shape errors in forging: developing a metric and an inverse model, *Journal of the Institution of Mechanical Engineers*, Vol 215, part B, pp 1229-1240.
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An application of "agent-oriented" techniques to symbolic matching and object recognition, *Journal of Pattern Recognition Letters*, Vol 23, pp419-429.
- Adams, B., Dorai, C. and **Venkatesh, S.** (2002)
Automatic extraction of expressive elements from motion pictures: Tempo *IEEE Transactions on Multimedia*. Vol 4, No 3.
- Adams, B., Dorai, C. and **Venkatesh, S.** (2002)
Finding the beat: An Analysis of the rhythmic elements of motion pictures, *International Journal of Image and Graphics*, Vol 2, No 2, pp215-245.

Tuah, N., Kumar, M., **Venkatesh, S.** and Das, S. (2002)
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Bui, H.H. , Venkatesh, S. and **West, G.** (2002)
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Truong, B., **Venkatesh, S.** and Dorai, C. (In Press)
Automatic scene extraction in motion pictures, Journal of IEEE Transactions on circuits and systems for video technology.

Lazarescu, M., Venkatesh, S. and **Bui, H.H.** (In Press)
Using multiple windows to track concept drift, Journal of Intelligent Data Analysis.

Loh, A, Robey, M. and **West, G.** (In Press)
Analysis of the interaction between edge and line finding techniques. Pattern Recognition.

Conference Proceedings

Gang, Z., Qinging, Z., Haiying, J. and **Liu, W.Q.** (2000)
Generalized lyapunov equations for stable singular system, IEEE Conference on Decision and Control, Sydney, Australia.

Chen, Y. P., Zhang, Q. and **Liu, W. Q.** (2000)
Fault-Tolerant Control About Integrity for Descriptor Systems, IEEE Conference on Decision and Control held in Sydney, Australia.

An, S., J., Hu, X., Vucetic, B. and **Liu, W. Q.** (2000)
Results for parametric shifted H-infinity performance of weighted interval plants, IEEE Conference on Decision and Control, Sydney, Australia.

Liu, W. Q. and Sreeram, V. (2000)
Model reduction for singular systems, IEEE Conference on Decision and Control held in Sydney, Australia.

Gao, F. and **Liu, W. Q.** (2000)
Nonlinear feedback control on Lorenz chaotic systems, Asian Control Conference, Shanghai, China.

Lazarescu, M. and **Venkatesh, S.** (2000)
On the recognition of American Football formations from images, IEEE Pacific Rim Conference on Multimedia, Sydney, Australia, pp 261-264.

Tassone, E, **West, G.,** and **Venkatesh, S.** (2000)
Determining motion components using point distribution model, 3rd International Conference on Multimodal Interfaces, Beijing, China, pp 363-370.

Adams, B., Dorai, C., and **Venkatesh, S.** (2000)
Study of shot length and motion as contributing factors to movie tempo, ACM Multimedia. Los Angeles, pp 353-355.

Adams, B., Dorai, C., and **Venkatesh, S.** (2000)**(Best Paper Award)**
Role of Shot length in characterising tempo and dramatic story sections in motion pictures, IEEE Pacific Rim Conference on Multimedia, Sydney , Australia, pp 54-57.

Truong, B., Dorai, C., and **Venkatesh, S.** (2000)
New enhancements to cut, fade and dissolve detection process. ACM Multimedia, Los Angeles, pp219-227.

Truong,B., Dorai, C. , and **Venkatesh, S.** (2000)
Automatic genre identification for content based video, International Conference on Pattern Recognition, Barcelona, Spain, pp 230-233.

- Lazarescu, M.**, Bunke, H. and **Venkatesh, S.** (2000)
Graph Matching: Fast candidate elimination using machine learning techniques, International Workshop on Syntactic and Structural Pattern Recognition, Alicante, Spain, pp 236-245.
- Adams, B., Dorai, C., and **Venkatesh, S.** (2000)
Novel approach to detecting movie tempo and dramatic story sections in motion pictures, International Conference on Image Processing, Vancouver, Canada, pp 283-286.
- Truong, B., Dorai, C. , **Venkatesh, S.** (2000)
Improved fade and dissolve detection, International Conference on Image Processing, Vancouver, Canada, pp 961-964.
- Bui, H., Venkatesh, S.** and **West, G.** (2000)
On the recognition of abstract Markov policies, 17th National Conference on Artificial Intelligence, AAAI 2000, Austin, Texas, pp 524-530.
- Adams, B., Dorai, C. and **Venkatesh, S.** (2000)
Towards automatic extraction of expressive elements from motion pictures: Tempo, IEEE International Conference on Multimedia and Expo, New York, USA.
- Bui, H., Venkatesh, S.** and **West, G.** (2000)
A probabilistic framework for tracking in wide area environments, International Conference on Pattern Recognition, Barcelona, Spain, pp 720-705.
- Lazarescu, M., Venkatesh, S.** and **West, G.** (2000)
On the incremental learning and recognition of the pattern of movement of multiple labelled objects in dynamic scenes, International Conference on Pattern Recognition, Barcelona, Spain, pp 652-655.
- Chambers, G., and **West, G.** (2000)
Segmentation of video sequences using principles of perceptual organization, APRS/IEEE Workshop on Stereo Image and Video Processing (WSIVP), Sydney, pp 15-18.
- West, G.** and Tassone, E., (2000)
Assessing different features for pose refinement, International Conference on Pattern Recognition: ICPR'2000, Barcelona, Spain, pp 687-690.
- Loh, A., **Robey, M.** and **West, G.** (2000)
IFOSART: A noise resistant neural network capable of incremental learning, International Conference on Pattern Recognition: ICPR'2000. Barcelona, Spain, pp 989-992.
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Stability analysis and design of t-s fuzzy descriptor systems, IEEE Conference on Decision and Control. FRA07-5, pp 3962-3967.
- Li, S.J., Li., **Liu, W.Q.** and Hill., H. (2001)
Lyapunov equation for stable singular systems, ICOTA 2001, pp1535-1540.
- Gao, Z., **Liu, W.Q.** and So, A.T.P. (2001)
Decentralized bezout factorisation for generalized decentralized control systems, ICOTA2001, pp1549-1556.
- Zhang, Q.L. and **Liu, W.Q.** (2001)
Lyapunov approach to the study of singular systems, IEEE Conference on Decision and Control, Orlando, Florida, THA11-1, pp2844-2849.
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Robust stability of polynomials with nonlinear dependent coefficient perturbations, IEEE Conference on Decision and Control, Orlando, Florida, WeA09-3, pp1551-1556.
- Moncrieff, S., Dorai, C. and **Venkatesh, S.** (2001)
Analysis of environmental sounds as indexical signs in film, IEEE Pacific Rim Conference on Multimedia, Beijing, China.
- Moncrieff, S., Dorai, C. , and **Venkatesh, S.** (2001)
Affect computing in film through sound energy dynamics, ACM Multimedia Conference, Ottawa, Canada, pp 525-527.

- Dorai, C. and **Venkatesh, S.** (2001)
Bridging the semantic gap in content management: Computational media aesthetics, COSIGN 2001, Conference on Computational Semiotics for Games and New Media, Amsterdam, pp 94-100.
- Iverach, R., West, G.,** and Cox, S. (2001)
Extracting edges from an edge encoded quadtree, IASTED Int. Conference on Signal Processing, Pattern Recognition and Applications, SPPRA, Rhodes, Greece, pp138-142.
- Lazarescu, M. , Venkatesh, S.** and **Bui, H.** (2001)
An application of concept drift tracking to average frame interpretation, Conference on Artificial Intelligence and Applications, Marbella, Spain.
- Lazarescu, M. , Venkatesh, S.** and **Bui, H.** (2001)
Tracking concept drift robustly, Conference on Applied Informatics, Innsbruck , Austria, pp 38-43.
- Moncrieff, S., Dorai, C., and **Venkatesh, S.** (2001)
Detecting indexical signs in the film audio for scene interpretation, International Conference on Multimedia and Expo, Tokyo, Japan, pp 1192-1195.
- Lazarescu, M., Venkatesh, S.** and **Bui, H. H.** (2001)
An application of concept drift tracking to average frame interpretation, Artificial Intelligence and Applications, Marbella, Spain.
- Adams, B., Dorai, C., and **Venkatesh, S.** (2001)
Towards automated film rhythm extraction, International Conference on Multimedia and Expo, Tokyo, Japan, pp 1056-1059.
- Truong, B., Dorai, C., and **Venkatesh, S.** (2001)
Determining dramatic intensification via flashing lights in movies, ACM Multimedia, International Conference on Multimedia and Expo, Tokyo, Japan, pp 61-64.
- Tuah, N., Kumar, M. and **Venkatesh, S.** (2001)
Effect of speculative prefetching on network load in distributed systems, International Parallel and Distributed Processing Symposium, San Fransico, USA.
- Bui, H. H.** (2002)
Efficient approximate inference for online probabilistic plan recognition, AAAI Fall Symposium on Intent Inference for Users, Teams and Adversaries, Falmouth, MA, USA.
- Lazarescu, M.** (2002)
Applications of decision trees, Artificial Intelligence and Applications (AIA2002), Malaga, Perth, Australia.
- Xu, L., Dong, Z., **Liu, W.Q.** and Tay, E.P.A. (2002)
Recurrent neural networks for time series identification and forecast, 4th Asia Pacific Conference on Simulated Evolution and Learning, Vol.18, No. 22, pp414-418.
- Liu, W.Q.,** Xin, X. and Kaneda, M. (2002)
The maximal stability radius for symmetric singular systems, Japanese Control Conference, pp123- 127.
- Xu, L., **Liu, W.Q.** and **Venkatesh, S.** (2002)
A two-stage vector quantization approach via self-organizing map, International Conference on Signal Processing, Beijing, pp913-916.
- Tjahyadi, R. and **Liu, W.Q.** (2002)
Image classification for quality compression with wavelet filters based on image feature analysis, ICSP'02, Beijing, pp921-924.
- Zhang, Q. L., Sreeram, Q. L. . and **Liu, W.Q.** (2002)
H model reduction for singular systems, American Control Conference, pp1168-1174.

- Xu, L., **Liu, W.Q.** and **Venkatesh, S.** (2002)
A new vector quantization approach via self-organizing map', 3rd WSEAS International Conference on Neural Networks and Applications (NNA '02), pp4281-4288.
- Xu, L., Dong, Z., **Liu, W. Q.**, and Tay, E.P.A.. (2002)
Recurrent neural networks for time series identification and forecast, 4th Aisa Pacific Conference on Simulated Evolution and Learning. pp414-418.
- Lau, W., **Venkatesh, S.** and Kumar, M. (2002)
A cooperative cache architecture in support of caching multimedia objects in MANETs, 5th ACM International Workshop on Wireless Mobile Multimedia, ACM Press, pp56-63.
- Lau, W., Kumar, M. and **Venkatesh, S.** (2002)
A generalised cost-aware caching scheme for caching continuous media objects in best-effort network environments, 4th International Workshop on Distributed Computing.
- Truong, B.T., **Venkatesh, S.** and Dorai, C. (2002)
Application of computational media aesthetics methodology to extracting color semantics in Film, ACM Multimedia, Juan Les Pins, France.
- Phung, D., **Venkatesh, S.** and Dorai, C. (2002)
High level segmentation of instructional videos based on content density, ACM Multimedia, Juan Les Pins, France.
- Truong, B.T., **Venkatesh, S.**, Dorai, C. (2002)
Neighbourhood coherence and edge based approaches for film scene extraction, International Conference on Multimedia and Expo, Lausanne.
- Lazarescu, M., **Venkatesh, S.** and **West, G.** (2002)
On the automatic indexing of cricket using camera motion parameters, International Conference on Multimedia and Expo, Lausanne.
- Tassone, E., **West, G.** and **Venkatesh, S.** (2002)
Comparing shape and temporal PDMs, International Workshop on Syntactic and structural pattern recognition, Ontario City, pp195-204.
- Truong, B.T., Dorai, C. and **Venkatesh, S.** (2002)
Neighbourhood coherence and edge based approaches for film scene extraction, International Conference on Pattern Recognition, Quebec City.
- Phung, D., Dorai, C. and **Venkatesh, S.** (2002)
Narrative structure analysis with education and training videos for E-Learning, International Conference on Pattern Recognition, Quebec City.
- Chambers, G., **Venkatesh, S.**, **West, G.** and **Bui, H.** (2002)
Hierarchical recognition of intentional human gestures for sports videos, International Conference on Pattern Recognition, Quebec City.
- Tassone, E., **West, G.** and **Venkatesh, S.** (2002)
Temporal PDMs for gait classification , International Conference on Pattern Recognition, Quebec City.
- Nguyen, N., **Venkatesh, S.**, **West, G.** and **Bui, H.** (2002)
Hierarchical monitoring of peoples behaviour in complex environments using multiple cameras, International Conference on Pattern Recognition, Quebec City.
- Adams, B., Dorai, C. and **Venkatesh, S.** (2002)
Finding the beat: An analysis of rhythmic elements in motion pictures, Asian Conference on Computer Vision, Melbourne, Australia.
- Nguyen, N., **West, G.** and **Venkatesh, S.** (2002)
Coordination of multiple cameras to track people, Asian Conference on Computer Vision, Melbourne, Australia.

- Dinh, P., Dorai, C. and **Venkatesh, S.** (2002)
Video genre Classification using audio wavelet coefficients, Asian Conference on Computer Vision, Melbourne, Australia.
- Tassone, E., **West, G.** and **Venkatesh, S.** (2002)
Classifying complex human motion using point distribution models, Asian Conference on Computer Vision, Melbourne, Australia.
- Chambers, G., **Venkatesh, S., West, G.** and **Bui, H.H.** (2002)
Hierarchical recognition of intentional human gestures for sports video annotation, International Conference on Pattern Recognition (ICPR-2002). Quebec, Canada.
- Zhang Y., **Liu, W.Q.** and **Venkatesh, S.** (In Press)
A simple approach for performance evaluation of a local computer network, 3rd International DCDIS Conference on Engineering Applications and Computational Algorithms.
- Xu, Z., Dong, Z. and **Liu, W.Q.** (In Press)
Short-term electricity price forecasting using wavelet and SVM techniques, 3rd International DCDIS Conference on Engineering Applications and Computational Algorithms.
- Nguyen, N. T., Bui, H. H., **Venkatesh, S.** and **West, G.** (In Press)
Recognising and monitoring high-level behaviours in complex spatial environments, IEEE International Conference on Computer Vision and Pattern Recognition (CVPR 2003), Madison, Wisconsin, USA.
- Luhr, S., Bui, H. H., **Venkatesh, S.** and **West, G.** (In Press)
Recognition of human activity through hierarchical stochastic learning, IEEE International Conference on Pervasive Computing and Communications. Texas, USA.
- Peursum, P., **Venkatesh, S., West, G.** and **Bui, H. H.** (In Press)
Object labelling from human action recognition, IEEE International Conference on Pervasive Computing and Communications. Texas, USA.

Seminars & Invited Talks

Presentations

Prof S Venkatesh

"An Application of Machine Learning Techniques for the Classification of Glaucomatous Progression", International Workshop on Syntactic and Structural Pattern Recognition, Ontario City, Canada, 2002.

"Neighbourhood Coherence and Edge Based Approaches for Film Scene Extraction", International Conference on Pattern Recognition, Quebec City, Canada, 2002.

"Narrative Structure Analysis with Education and Training Videos for E-Learning", International Conference on Pattern Recognition, Quebec City, Canada, 2002.

"Finding the Beat: An Analysis of Rhythmic Elements in Motion Pictures", Asian Conference on Computer Vision, Melbourne, 2002.

"Coordination of Multiple Cameras to Track People", Asian Conference on Computer Vision, Melbourne, 2002.

"Video Genre Classification Using Audio Wavelet Coefficients", Asian Conference on Computer Vision, Melbourne, 2002.

"Classifying Complex Human Motion Using Point Distribution Models", Asian Conference on Computer Vision, Melbourne, 2002.

Invited Talks

Prof S Venkatesh

The Inverse Spielberg Problem, Mitusubishi Electric Research Labs, New Jersey, USA.

The Inverse Spielberg Problem: Extracting elements of visual grammar, University of Texas, Arlington, USA, Arizona State University, Phoenix, USA, National University of Singapore, Singapore, Nanyang Technological University, Singapore.

Finding the Beat: extracting visual rhythm, Arizona State University, Phoenix, USA.

Conferences Chaired/Co-chaired

Prof S Venkatesh

Program Co-Chair Asian Conference on Computer Vision, Melbourne, 2002.

Program Committee Syntactic and Structural Pattern Recognition, Ontario, 2002.

Program Committee ACM Multimedia, France, 2002.

Program Committee IEEE International Conference on Multimedia and Expo, Switzerland, 2002.

Program Committee Seventh Pacific Rim International Conference on AI, Tokyo, 2002.

Program Committee Machine Learning in Computer Vision, Sydney, 2002.

Program Committee Image and Vision Computing, Auckland, 2002.

Program Committee International Workshop on Multimedia Information Retrieval, Juan Les Pins, 2002.

Professional Memberships

Prof G West

Member of Editorial Board: Image and Vision Computing.

Prof S Venkatesh

Member of Program Committee: IEEE Pacific Rim Conference on Multimedia, Sydney, Australia.

Senior Member, Institute of Electrical and Electronic Engineers (IEEE)

Member, American Association of Artificial Intelligence (AAAI)

Member, Australian Computer Society (ACS)

Member, Australian Pattern Recognition Society (APRS)

Member of Research & Development Committee, (Curtin University of Technology)

Member of Graduate Studies Committee for the Faculty of Science (Curtin University of Technology)

Member of Divisional Board, Engineering & Science (Curtin University of Technology)

Travel

Prof S Venkatesh

International Workshop on Syntactic and Structural Pattern Recognition, Ontario City, Canada.

International Conference on Pattern Recognition, Quebec City, Canada.

Asian Conference on Computer Vision, Melbourne, Australia.

ACM Multimedia, Juan Les Pins, France.

Prof G West

MIRI - Kuching, Malaysia.

University of South Florida - visiting Prof K Bowyer.

University of Detroit Mercy, Detroit.

George Washington University, Washington, DC.

University of South Michigan.

Dr W Q Liu

Asian Control Conference, Singapore

Japanese Control Conference, Japan

Okayama Prefectural University, Japan

Chinese Academy of Science, China

External Research Grants

- 1) DSTO MOD - Development of a situation assessment tool for submarines.
(Prof S Venkatesh and Dr A Pearce)
1998-2000 \$200,000
- 2) ARC - Developing methods for building a 3D solid model object description from multiple sensor types.
(Dr M Robey, Prof G West and Prof T Caelli)
1998-2000 \$167,000
- 3) State Government of Western Australia, Funds for preparing business plan for Center of Excellence.
(Prof S Venkatesh and Prof P Lee - Murdoch University)
1999 \$20,000
- 4) Large ARC - The inverse Spielberg problem: Extracting elements of visual grammar for synthesis, training and retrieval from video.
(Prof S Venkatesh and Dr C Dorai - IBM T J Watson)
2000-2003 \$173,700
- 5) SPIRT - Human centered tools and techniques for interactive data mining in financial systems,
(Prof S Venkatesh, Prof G West and Mr J Wong - CCK Treasury systems)
2000-2003 \$63,240
- 6) Terravision Scholarship - Encoding and compressing weather data for low data rate transmission.
(Prof S Venkatesh, Prof G West)

1999 \$28,000
- 7) Support for Store and Forward Tele-dermatology Research and Development.
(Dr C Clay and Prof G West)
1999 \$10,000
- 8) ARC Large grant - Learning to recognise actions and functions in image sequence.
(Prof S Venkatesh and Prof G West)
2000 \$60,000
- 9) ARC Large Grant - Semantic Compression: Using accelerometers to recognise complex human gestures for video annotation and event detection.
(Prof G West and Prof S Venkatesh)
2001-2003 \$167,000
- 10) Centre of Excellence Program: iPOM, intelligent Process Operation Management
Co-Directors: Prof S Venkatesh, Prof P Lee (Murdoch University)
Other Participants: Prof G West, Dr P Lam (Murdoch University)
2000 \$1,033,671
- 11) The University Grant Scheme, combined with small ARC (University of Sydney): A unified approach to singular systems control design.
(Dr W Q Liu)
2000 \$14,000

- 12) ARC Fellowship Grant: The balanced realization and identification techniques for singular systems and their applications.
(Dr W Q Liu)
1999-2004 \$260,000
- 13) Australian Academy of Science, scientific visit.
(Prof S Venkatesh)
2001 \$7,750
- 14) Bridging the Semantic gap for building effective content management systems: Computational Media Aesthetics, ARC
Discovery.
(Prof S Venkatesh)
2002-2006 \$278,000
- 15) Web-based Tele dermatology
(Prof G West and Dr C Clay)
2002 \$142,000

Infrastructure

Prof S Venkatesh \$31,167

Prof G West \$14,521

Dr W Q Liu

Curtin Small ARC Scheme \$10142

ARC Fellowship Scheme \$7000

Prizes

Prof S Venkatesh

Best Paper Award, IEEE Pacific Rim Conference on Multimedia: "Role of shot length in characterising tempo and dramatic story sections in motion pictures".

Theses in Progress

Doctor of Philosophy

Leon Blackwell (Multidisciplinary stream Computer Graphics)

Thesis Title: Constrained optimal view selection and automated direction.

Ezra Tassone

Thesis Title: The representation and recognition of human motion using spatial and spatio temporal characteristics.

Scholarship: Australian Postgraduate Award

Graham Chambers

Thesis Title: Semantic compression: Using accelerometers to recognise complex human gestures for video annotation and event detection.

Scholarship: Australian Postgraduate Award

Gordon Thomas

Thesis Title: Optimisation of mine scheduling.

Robert Iverach

Thesis Title: Investigating N-Dimensional spatial data structures that encode both region and edge information for use in the geosciences.

Scholarship: CSIRO

Simon Moncrieff

Thesis Title: A computational understanding of audio aesthetics.

Scholarship: Australian Postgraduate Award

Nam Nguyen

Thesis Title: Co-ordination of multiple sensors to track and recognise multi-object actions.

Scholarship: Overseas Postgraduate Research Scholarship

Ba Tu Truong

Thesis Title: Extracting elements of visual grammar from films and television.

Scholarship: Curtin International Student Scholarship

Brett Adams

Thesis Title: Automatic extraction of semantic features from video programs.

Scholarship: Australian Postgraduate Award

Bernard Rolfe

Thesis Title: Classification of genetic reformation with respect to manufacturing central variables.

Scholarship: Australian Research Council/ANU

Simon Beard

Thesis Title: MetaFace: A virtual face metaphor and framework.

Scholarship: Australian Postgraduate Award

Quoc Dinh Phung

Thesis Title: Structuralising education and training videos: Towards the next generation of digital content management systems.

Scholarship: Curtin International Student Scholarship

Monica Ou

Thesis Title: Decision support in teledermatology using case-based reasoning.

Prem Dubey

Thesis Title: Use of eye tracking to navigate large data space.

Master of Science

Boaz Kogon

Thesis Title: Functional communication in autonomous software agents.

Hiep Quoc Pham

Thesis Title: Weather information system.

Scholarship: Industry (Terravision)

Honours

James Ko

Thesis Title: Application of artificial intelligence techniques for locating alarm patterns.

Adam Gandossi

Thesis Title: Linux access control: A Biomedical approach.

Lukman Sasmita

Thesis Title: An immunological clustering framework.

Theses Passed

Doctor of Philosophy

Allan Loh

Thesis Title: Intelligent acquisition of 3D information for generation of CAD models.

Honours

Ambrose Voon

Thesis Title: Alarm data analysis - Bayesian network approach.

Members



Prof G West



Dr J Ivins



Dr Andrew Turpin

The frontiers of biological research that contributes to medicine ("biomedicine") are increasingly reliant on sophisticated computer driven equipment and computationally intensive modelling and analysis techniques. The newly formed Biomedical Computing research group focuses on the development of software and computing systems required to support biomedical research. Due to the nature of its research, the group is highly collaborative, forming partnerships with practitioners, medical and biomedical researchers, and members of the commercial health industry from all over the globe.

During 2002 the group worked on three major projects: tele-dermatology, in collaboration with Roche pharmaceuticals; retinal image analysis, in partnership with Lions Eye Institute (Perth); and development of algorithms for clinical visual field testing, in collaboration with the University of Western Australia, The University of Melbourne, and Devers Eye Institute (Portland, Oregon). These projects are described in the following pages of this report. Early in 2002 we also concluded our development of handheld vision testing systems, a collaborative project with the JAEB Center for Health Research (Tampa, Florida).

In addition to its three major ongoing projects, the group is exploring several new projects. These include software support for a study on diabetic children at Princess Margaret Hospital (Perth); development of software for real-time measurement of retinal blood vessels at the Lions Eye Institute (Perth); tele-audiology with the Lions Ear Institute (Perth); visual field analysis in partnership with researchers from Dalhousie University (Halifax, Canada); clinical trials of new visual field algorithms in conjunction with researchers at Bristol Hospital (England); and data-mining of the NIH protein database in conjunction with Dr Steven Bottomley from the School of Biomedicine at Curtin University

Current Research Projects

Algorithms for Visual Field Testing

Dr A Turpin, Dr A McKendrick (UWA) and Dr Paul Spry (Bristol Eye Hospital, England)

A fast and accurate visual field assessment algorithm is a vital tool for ophthalmologists in diagnosing and monitoring eye diseases such as glaucoma. Existing algorithms have not been subject to formal algorithmic analysis, which our recent research shows can contribute to the further development of these algorithms. During 2002 we published data on new algorithms for several clinical tests that will be adopted in commercial instruments. Both mathematical and clinical evaluation of new algorithms is in progress. During 2002 we have constructed experiments for a major clinical trial of our new algorithms at the Bristol Eye Hospital.

Funding: Charitable Trust for United Bristol Hospitals £6500.

Classifying Progressive and Stable Glaucoma I

Dr M Lazarescu and Dr A Turpin

Glaucoma is a disease of the optic nerve that can progress over time resulting in blindness. We have a data set of visual field measurements and optic nerve images for both stable and progressive glaucomatous patients over a period of four years. During 2002 we have employed Decision Tree techniques from the machine learning community to classify glaucomatous progression as accurately as current techniques, but using only three years of patient data rather than the currently required four. An added benefit of the technique is that the decision tree classifier can be readily understood by clinicians, unlike classifiers such as Neural Networks or Support Vector Machines. This work will continue through 2003.

Classifying Progressive and Stable Glaucoma II

Dr A Turpin, Dr A McKendrick (UWA) and Prof B Chauhan (Dalhousie University, Canada)

This project commenced in late 2002 and is tackling the same problem as the previous project, but from the perspective of a clinical psychophysicists. The response behaviour of patients who perform psychophysical tasks such as automated perimetry (the standard technique for measuring visual fields and monitoring vision loss due to glaucoma) has been well studied. This project attempts to reconcile this well known behaviour with longitudinal clinical visual field data obtained from Prof Chauhan.

Optic Nerve Head Modelling from HRT Images

Dr J Ivins, Dr A Turpin, Dr W Morgan (Lions Eye Institute, Perth)

We are working with a unique dataset gathered at the Lions Eye Institute that contains images of the optic nerve head under various pressures from within the eye. Thus far we have created a novel alignment algorithm for registering the images, and visualisation tools to assist ophthalmologists in studying the biomechanics of the lamina cabrosa under pressure changes. During 2003 we expect to make further, significant progress on this project.

Identifying the Risks of Hypoglycaemic Episodes During Sleep

Dr A Turpin and Assoc. Prof S Stick (Princess Margaret Hospital)

Up to 40% of children have hypoglycaemic episodes while they are asleep, which is dangerous as their "flight or fight" instincts are not active. This project is designed to assess the risk of such episodes during sleep. Our group is providing software for the experiments which will be conducted at the hospital's sleep lab during 2003.

Web-based Teledermatology

Prof G W West, Mr C Clay (Consultant Dermatologist)

This project is concerned with developing web-based tools to aid general practitioners (GPs) in the diagnosis of skin disorders such as rashes and lesions. The GP accesses a web page that guides them through check lists of symptoms and patient history for example. Once the information is entered, it is all formatted as web pages and emailed to the consultant who can study it and respond to the GP when time is available. Current work is concerned with using images, graphics, video and case-based reasoning to improve the reliability and speed of the process of diagnosis.

Funding:	Donation from Roche Pharmaceuticals	\$10,000
	S.C.R.I.F	\$132,000

Data Mining Protein Databases

Dr A Turpin and Dr S Bottomley (School of Biomedical Sciences, Curtin)

Recently large protein databases containing amino-acid sequence and structure information have become available. This project is using data mining techniques to discover patterns within such sequences with an aim to applying the information to the Protein Folding Problem. That is, given a sequence of amino acids that form a protein, specify the final three-dimensional shape of the protein.

Tele-audiology

Prof G West, Dr A Turpin and Dr R. Eikelboom (Lions Ear and Hearing Institute)

This project is designing a system to perform hearing tests remotely.

Measurement of Small, Pulsating Blood Vessels

Dr J Ivins, Dr A Turpin and Dr S Cringle (Lions Eye Institute)

This project employs image processing techniques to extract the width of small blood vessels in the retina as they pulsate from a real time video stream. Current software handles large vessels well, but the smaller vessels remain a challenge.

Publications

Journal Articles

Spry, P.G.D., Johnson, C.A., Bates, A.B., **Turpin, A.** and Chauhan, B.C. (2002)

Spatial and temporal processing of threshold data for detection of progressive glaucomatous visual field loss, *Journal of Archives of Ophthalmology*, Vol 120, pp173-180.

Turpin, A., McKendrick, A.M., Johnson, C.A. and Vingrys, A.J. (2002)

Performance of efficient test procedures for frequency doubling technology (FDT) perimetry in normal and glaucomatous eyes, *Journal of Invest Ophthalmol Vis Sci* Vol 43, pp709-715.

Turpin, A., McKendrick, A.M., Johnson, C.A. and Vingrys, A.J. (2002)

Development of efficient threshold strategies for frequency doubling technology perimetry using computer simulation, *Journal of Invest Ophthalmol Vis Sci*, Vol. 43, pp308-313.

Beck, R.W., Moke, P.S., **Turpin, A.H.**, Ferris, F.L., SanGiovanni, J.P., Johnson, C.A., Birch, E.E., Chandler, D.L., Cox, T.A., Blair, R.C. and Kraker, R.T. (In Press)

A computerized method of visual acuity testing: Adaptation of the early treatment of diabetic retinopathy study testing protocol, *American Journal of Ophthalmology*, Vol. 135, pp194-205.

Spry, P.G.D., Johnson, C.A., McKendrick, A.M. and **Turpin, A.H.** (In Press)

Measurement error of visual field tests in glaucoma, *Br J Ophthalmol*.

Conference Proceedings

Lazarescu, M., Turpin, A. and **Venkatesh, S.** (2002)

An application of machine learning techniques for the classification of glaucomatous progression, *Syntactical and Structural Pattern Recognition (SSPR 2002)*, Ontario City, pp243-251.

SanGiovani, J.P., Beck, R.W., Moke, P.S., **Turpin, A.H.**, Holmes, J.M., Repka, M.X., Birch, E.E., Miller, J.M. and Johnson, C.A. (2002)

A new PC-based method of measuring visual acuity in clinical trials, *ARVO 2002*, Ft Lauderdale, USA.

Lazarescu, M., Turpin, A. and **Venkatesh, S.** (In Press)

Identifying glaucomatous progression using decision trees, *Twenty-First IASTED International Multi-Conference on Applied Informatics (AI2003)*, Innsbruck, Austria.

Turpin, A. and McKendrick, A.M. (In Press)

EMU: A new algorithm for automated perimetry, *ARVO 2003*, Ft Lauderdale, Florida, U.S.A.

Seminars & Invited Talks

Presentations

Dr A Turpin

Automatic detection of glaucomatous progression, Australian Ophthalmic and Visual Sciences Meeting, Sydney, Australia.

Travel

Dr A Turpin

University of Melbourne
Monash University, Melbourne
RMIT University, Melbourne
University of Sydney
University of Tampere, Finland
Bristol Eye Hospital, England

Dr J Ivins

Sri Lankan Institute of Information Technology (SLIIT), Colombo, Sri Lanka

Thesis in Progress

Honours

Alex Pooley

Thesis Title: Distribution of polypeptide phi and psi dihedrals in the protein data bank.

Jonathan Gostelow

Thesis Title: Toward a model of the behaviour of the optic nerve head under pressure.

Thesis Passed

Honours

Long Ngoc Nguyen

Thesis Title: Using machine learning to diagnose progressive glaucoma patients

Members



Dr B Vonkonsky



Mr A Marriott



Dr L Li

Research in graphics is geared to facilitate such application areas as architecture, medicine, physiotherapy and printing.

Current Research Projects

Facial Animation

Mr A Marriott

Research into facial animation continues with over 1000 sites throughout the world using the fascia or fax system. The system and images have been used in computer generated animations in Europe and Australia.

Human Animation

Dr B von Konsky

Medical and physiotherapy students are required to visualize internal anatomic structures to develop hypothesis regarding anatomic function. While cadaver dissection, medical illustrations, and physical models have been traditionally used for this purpose, this research project examines the supplemental; uses of advanced 3D computer visualizations in medical education. A dynamically driven model of muscle and limb dynamics is used to animate the human form, in conjunction with an image database to correlate external surface features with rendered representations of internal anatomy.

Publications

Conference Proceedings

Hunt, M., **von Konsky, B.**, **Venkatesh, S.**, and Petros, P. (2000)

Bayesian networks and decision trees in the diagnosis of female urinary incontinence, World congress on medical physics and biomedical engineering, in conjunction with the IEEE Engineering in Medicine and Biology Society, Chicago, USA.

Shan, L. and **Li, L.** (2001)

Feature based articulated human posture reconstruction from monocular video sequences, The International Conference on Imaging Science, System and Technology, Las Vegas, USA.

Zhao, J. and **Li, L.** (2001)

Energy optimization for human animation from monocular images, The International Conference on Imaging Science, System and Technology, Las Vegas, USA.

Ng, S. C. and **Li, L.** (2001)

A psychophysically-based colour model for human skin, The International Conference on Imaging Science, System and Technology, Las Vegas, USA.

Ng, S. C. and **Li, L.** (2001)

A multi-layered reflection model of natural human skin, The International Conference on Computer Graphics '2001, Hong Kong.

Zhao, J. and **Li, L.** (2001)

Model-based human posture reconstruction from monocular image, 3rd International Conference on Information, Communication and Signal Processing (ICICS'01), Singapore.

Shan, L., and **Li, L.** (2001)

Articulated human posture reconstruction from tracked monocular video sequences, 3rd International Conference on Information, Communication and Signal Processing (ICICS'01), Singapore.

Zhao, J., **Li, L.** and Kwoh, C. K. (2002)

Human posture reconstruction from monocular images based on criterion function, 5th International Conference on Computer Graphics and Imaging (CGIM 2002), Hawaii, USA.

Zhao, J., **Li, L.** and Kwoh, C. K. (2002)

Hierarchical approach for human animation from monocular images, 2nd International Conference of Visualization, Imaging and Image Processing (VIIP 2002), Malaga, Spain.

Vasily, V. and **Li, L.** (2002)

Adaptive local refinement and simplification of cloth meshes, The International Conference of Information Technology and Application (ICITA 2002), Bathurst, Australia.

Li, L. and Tan, L. S. (2002)

An on-line sign language communication system, The International Conference of Information Technology and Application (ICITA 2002), Bathurst, Australia.

Blackwell, L, **von Konsky, B.** and **Robey, M** (2001)

Petri net script: A visual language for describing action, behaviour and plot, 24th Annual Australasian Computer Science Conference, Australian Computer Society.

Theses in Progress

Doctor of Philosophy

Andrew Marriott

Thesis Title: Software based mentoring system.

Leon Blackwell (Multidisciplinary stream - Artificial Intelligence)

Thesis Title: Constrained optimal view selection and automated direction.

Scholarship: Australian Postgraduate Award

Honours

Derek Byrnes

Thesis Title: Mechanical NURBS-based joint deformations for lifelike animation of 3D body scans in the presence of motion data extracted from film.

Theses Passed

Honours

Darren Wan

Thesis Title: A black box designed text to speech module in a talking head.

Hai Huong Dam

Thesis Title: The virtual weather woman.

C Serge De Souza

Thesis Title: First implementation of VHML on the java text to speech synthesizer.

The main areas of research being pursued include content based retrieval of multimedia data, and discovery of interesting patterns (or knowledge discovery) in large databases.

Members



Dr R Gopalan



Dr A Turpin



Dr D Reid

Current Research Projects

Content-based Search of Video Databases

Dr R Gopalan and Dr M G Nair (Maths and Stats)

Investigations and approaches to searching compressed video data for information retrieval.

Objective Comparator

Dr D Reid

This is research into a mathematical concept of comparisons in an attempt to explore means by which algorithms can be developed. The technique was first developed by G Rasch in the 1960's in attempting to determine a model in the midst of a mass of educational data.

Data Warehousing Using a Cluster of PCs

Dr R Gopalan

Aims to study the suitability of a cluster of PCs for processing queries on data warehouse.

Algebraic Specification of Data Mining Queries

Dr R Gopalan

This project is aimed at seamlessly integrating data mining queries with database systems.

Optimisation of Data Mining Queries

Dr R Gopalan

A tightly coupled optimizer is being developed in this project. It also explores faster algorithms for association rule mining.

Information Retrieval Systems

Dr A Turpin, Assoc Prof W Hersh (Oregon Health and Sciences University)

While batch experimentation has shown that IR systems have improved dramatically over recent years, our experiments with real users show that they perform just as well with old technology. This research investigates why the seemingly improved systems seem to offer little benefit to human searchers.

Publications

Conference Proceedings

Rudra, A. and **Gopalan, R.** (2000)

Adaptive use of a cluster of PCs for data warehousing applications: Some problems and Issues, ACM Symposium on Applied Computing 2000, Como, Italy, pp 698-703.

Fung C., Law K., Wong K., and **Gopalan R.** (2000)

Lithofacies characteristics discovery from well log data, Intelligent Data Engineering and Automated Learning - IDEAL 2000, K.S. Leung, L-W. Chan, and H. Meng (Eds.), LNCS 1983, Springer-Verlag.

Rudra, A. and **Gopalan, R.** (2001)

Data warehousing and OLAP in a cluster computer environment. Americas Conference on Information Systems (AMCIS 2001), Boston, Massachusetts, USA, pp 336-342.

Turpin, A. and Hersh, W. (2001)

Why batch and user evaluations do not give the same results, 24th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval, New Orleans LA, USA, pp 225-231.

Turpin, A. and Hersh, W. (2001) DBS

Why batch and user evaluations do not give the same results, 24th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval, New Orleans LA, pp225-231.

Gopalan, R., Nurrudin, T., and Sucahyo, Y.G. (2002)

Algebraic specification of association rule queries. SPIE International Conference on Data Mining and Knowledge Discovery: Theory, Tools and Technology, Orlando, Florida, USA, pp 77-87.

Gopalan, R. and Sucahyo, Y.G. (2002)

ITL-Mine: Mining frequent itemsets more efficiently, International Conference on Fuzzy Systems and Knowledge Discovery, Singapore, pp167-171.

Gopalan, R., Nurrudin, T., and Sucahyo, Y.G. (2002)

Building a data mining query optimizer, Australasian Data Mining Workshop, Canberra, Australia, pp109-116.

Gopalan, R. and Lee, G. (2002)

Indexing image databases using untrained 4D holographic memory model, 15th Australian Joint Conference on Artificial Intelligence, Canberra, Australia, LNAI 2557, Springer, pp237-248.

Gopalan, R. and Sucahyo, Y.G. (2002)

TreelTL-Mine: Mining frequent itemsets using pattern growth, Tid intersection and prefix tree, 15th Australian Joint Conference on Artificial Intelligence, Canberra, Australia, LNAI 2557, Springer, pp535-546.

Turpin, A. and Hersh, W. (2002) DBS

User interface effects in batch versus user IR experiments, 25th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval (SIGIR2002), Tampere, Finland.

Sucahyo, Y.G. and **Gopalan, R** (In Press)

CT-ITL: Efficient frequent item set mining using a compressed prefix tree with pattern growth, 14th Australasian Database Conference, Adelaide, Australia.

Gopalan, R. and Sucahyo, Y.G. (In Press)

Fast frequent itemset mining using compressed data representation, IASTED International Conference on Databases and Applications (DBA'2003), Innsbruck, Austria.

Gopalan, R. and Sucahyo, Y.G. (In Press)

Improving the efficiency of frequent pattern mining by compact data structure design, 4th International Conference on Intelligent Data Engineering and Automated Learning (IDEAL), LNCS, Springer, Hong Kong.

External Research Grants

Dr R Gopalan

Curtin Travel Grant \$2,500
Prize - IEEE SMC'99 US\$500

Theses in Progress

Doctor of Philosophy

Amit Rudra

Thesis Title: On-line analytical processing and data mining in large distance.
Funding: Curtin Res Grant Scheme: \$7,500
School of IS R&D fund: \$29,000
CBS-R&D Fund: \$10,000
Total: \$46,500

Yudho Giri Sucahyo

Thesis Title: A tightly coupled optimiser for data mining with database systems.
Scholarship: AUSAID

Shaunghui Meng

Thesis Title: Data mining large data sets.

Master of Science

Mr Tariq Nuruddin

Thesis Title: Integration of data mining into database management.

Honours

Lubo Hong

Thesis Title: Table detection on WWW.

Theses Passed

Honours

Yung Yee Leong

Thesis Title: Data compression on homogeneous distributed system.

Damien R Pumphrey

Thesis Title: Clustering data sets incrementally.

Seminars & Invited Talks

Presentations

Dr A Turpin

ACM SIGIR Conference on Research and Development in Information Retrieval, Tampere, Finland.

Travel

Dr R Gopalan

Australian Joint Conference on Artificial Intelligence, Canberra, Australia.

Dr A Turpin

ACM SIGIR Conference on Research and Development in Information Retrieval, Tampere, Finland.
RMIT- Melbourne, Australia

The School is actively involved in research into Computer Networks and Communication. The School has already produced several highly regarded software packages for computer management.

Research is moving from passive monitoring into active monitoring of the network including remote capturing, and the interplay of RMON agents with intelligent agents to automate network management.

Other research involves setting up automated tests for distributed protocols and in analysis and generation of distributed programs.

Recently we have started active research in uniform information access in mobile computing environments with grants from ARC (Small) and the Australian Telecommunication Education and Research Board. Problems related to QOS for video on wireless and prefetching in wireless networks are under investigation.

Members



Prof S Venkatesh



Dr M Kumar



Dr W Q Liu



Dr D Reid



Dr T Soh

Current Research Projects

Detecting Change in Dynamic Communication Networks

Prof S Venkatesh, Dr M Kumar, Dr S Campbell and Mr K. Y. Lim

This project is in conjunction with the communications division of the DSTO (Defence Science & Technology Organisation). It seeks to find changes in dynamic communication networks using:

- a) graph theoretic methods
- b) pattern recognition methods like clustering

It also seeks to predict changes in dynamic networks by using hidden Markov models and time delay neural networks. The networks have size ranging from 500 nodes, 500 edges to 1 million nodes, 1 million edges.

Funding: (DSTO) 1998-2000 \$50,000

Using PDAs for Medical Research Data Collection

Dr A Turpin, P. Moke (JCHR), & Dr R Beck (JCHR)

This project is in collaboration with the JAEB Center for Health Research, Tampa, Florida, and involves development of Palm Pilot software to facilitate several large clinical studies of children's vision currently running in the USA.

Funding: Consultancy fees from JAEB Center for Health Research \$55,000

Publications

Journal Articles

Santoso, H., **Venkatesh, S.** and **Kumar, M.** (2000)

Adaptive MPEG filtering for mobile computing environment, *Journal of Visualization*, Vol 2, No 1.

Lim, K., **Kumar, M.** and Das, S. (2000)

Message ring-based channel reallocation for cellular wireless networks, *Computer Communications*, Vol 23, pp 483-498.

Chin, K. and **Kumar, M.** (2000)

AMTree: An active approach to multicasting in mobile networks, Special Issue on Wireless Multicast and Routing, ACM/Baltzer MONET.

Chin, K., **Kumar, M.** and Farrell, C. (2000)

A model for connection rerouting in mobile networks, ACM/Baltzer WINET.

Wang, G., Sreeram, V., and **Liu, W.Q.** (2001)

Balanced performance preserving controller reduction via additive perturbation, *Journal of IEEE on Automatic Control*, Vol 46, No 5, pp 771-775.

Duan, G., **Liu, W. Q.** and Thompson, S. (2001)

Robust model reference control for multivariable linear systems: A parametric approach, *Journal of Systems and Control Engineering of IMech*, Vol 215, pp 599-610.

Liu, W.Q., Yan, Y.W. and Sreeram, V. (2001)

Generalized Oja flow convergence analysis, *Journal of IEEE Transactions on Signal Processing*, Vol 49, No 10, pp2422-2430.

Gao, F., **Liu, W.Q.**, Sreeram, V. and Teo, K.L. (2001)

Feedback control of chaos of the Lorenz systems, *Journal of Dynamics and Control*, Vol 11, pp57-69.

Moke, P., **Turpin, A.**, Beck, R., Holmes, J., Repka, M., Birch, E., Hurtle, R., Kraker, R., Miller, J. and Johnson, C. (2001)

Development of a computerized method of visual acuity testing: adaptation of the Amblyopia Treatment Study visual acuity testing protocol, *American Journal of Ophthalmology*, pp 903-909.

Liu, W. Q., Tran, T. H. and Sirisena, H. (2002)

A new state space control scheme for host-gate way rate control protocol within intranets using ATM ABR service, *Journal of Computer Communications*, Vol. 25, pp1799-1810.

Zhang, Q. L., **Liu, W. Q.** and Hill, D. (2002)

A Lyapunov approach to analysis of discrete singular systems, *Journal of Systems and Control Letters*, Vol. 45, pp237-247.

Wang, G. Q., Sreeram, V. and **Liu, W. Q.** (2002)

Balanced performance preserving controller reduction, *Journal of Systems and Control Letters*, Vol 46, pp99-110.

Conference Proceedings

Chin, K., **Kumar, M.** and Farrell, C. (2000)

Enhancements to mobile IP with active networks. 2nd International Working Conference on Active Networks, Tokyo, Japan.

Tuah, N., **Kumar, M.** and **Venkatesh, S.** (2000)

Performance modelling of speculative prefetching for compound requests in low bandwidth networks. 3rd ACM/IEEE International Conference on Wireless and Mobile Multimedia (WoWMoM'00), Boston, USA.

Beck, R., Moke, P., **Turpin, A.**, Holmes, J., Repka, M., Birch, E., Miller, J. and Johnson, C. (2001)

Measuring visual acuity in children with a pc-based version of the amblyopia treatment study visual acuity testing protocol, Annual meeting of The Association for Research in Vision and Ophthalmology (ARVO), Ft Lauderdale, Florida, IOVS pp 42:4:s384

Lau, W., **Kumar, M.** and **Venkatesh, S.** (2001)

A flexible receiver-driven cache replacement scheme for continuous media objects in best-effort networks, 34th Hawaii International Conference on System Sciences, IEEE, Maui, Hawaii, USA.

Lau, W., **Venkatesh, S.** and **Kumar, M.** (2001)

A cache based mobility aware scheme for real time continuous media delivery in wireless networks, International Conference on Multimedia and Expo, Tokyo, Japan, pp1236-1238.

Wang, Q., Zhang, Q.L., Zhang, G.S. and **Liu, W.Q.** (2002)

Lyapunov equations with positive definite solution for descriptor systems, 4th Asian Control Conference, pp385-389.

Wang, Q., Zhang, Q. L. and **Liu, W. Q.** (2002)

Regional stability and stabilization for descriptor systems, 4th Asian Control Conference (ASCC 2002), pp1686-1692.

Wang, Q., Zhang, Q. L. and **Liu, W.Q.** (2002)

Covariance control for descriptor systems with uncertainties, 4th Asian Control Conference (ASCC2002), pp1680-1686.

Collaborations

Prof. K.L Teo, School of Applied Mathematics, Hong Kong Polytechnic University, Hong Kong.

Dr. Weiyong Yan, School of Electrical and Computer Engineering, Curtin University of Technology.

Prof. Q.L. Zhang, College of Science, Northeastern University, P. R., China.

Prof. Xing Wei, College of Science, Northeastern University, P. R., China.

Dr. G.R. Duan, School of Mechanical and Manufacturing Engineering, The Queen's University of Belfast, Belfast.

Prof. David Hill, School of Information and Electronical Engineering, University of Sydney, Australia.

Assoc. Prof. Seeram, Dept. of EEE, University of Western Australia, Perth, Western Australia.

Lixin Xu, Beijing Institute of Technology, P. R. China.

Dr. An Senjian, Dept. of EEE, Melbourne University, Victoria, Australia.

Assoc. Prof. Cishen Zhang, Dept. of EEE, Melbourne University, Victoria, Australia.

Dr. Zhiwei Gao, Hong Kong City University, Hong Kong.

External Research Grants

Travel Grant - Australian Academy of Sciences - Research in the area of quality service in wireless networks with an Italian collaboration.

(Dr M Kumar)

2000 \$6,000

IRES Grant for collaboration with Italian scientists

(Dr M Kumar)

2001 \$5,000

ARC Fellowship

(Dr W. Q. Liu)

(Basic salary plus \$7000 research funds)

Infrastructure

Dr W. Q. Liu

\$10,296

Theses in Progress

Master of Science

Donald Griffiths

Thesis Title: A method for program execution and migration between heterogeneous architectures.

Justin Lee

Thesis Title: Wireless sensor networks.

Honours

Dong-Kun Mun

Thesis Title: A centralized network management strategy using SNMP

Theses Passed

Doctor of Philosophy

William Hock Lau

Thesis Title: An investigation into information access improvement techniques for continuous media in distributed environments.

Kok Yong Lim

Thesis Title: QOS issues in ad-hoc networks.

Software Engineering

Software engineering is a fast emerging area of research. The current research of the School in this area is focused on developing appropriate engineering techniques for parallel and distributed software and real-time and fault-tolerant software.

Members



Dr B Vonkowsky



Dr D Reid



Dr J Ivins



Dr M Robey

Current Research Project

Validation of Object Orientated Software Designs

Dr J Ivins , Dr M Robey, and Dr B Von Kinsky.

This project is concerned with developing methods for automated comparison of user requirements (in the form of a Use Case Model) and the UML software design. The group also intends to investigate automated methods for checking the consistency of a UML software design.

Software Metrics for Large Scale Software Engineering Projects

Dr J Ivins , Dr M Robey, and Dr B Von Kinsky.

This project is concerned with furthering the development of metrics that can be applied to both a software design and its implementation in source code.

Publications

Conference Proceedings

Blackwell, L., **von Kinsky, B.**, and **Robey, M.** (2001)

Petri net script: A visual language for describing action, behaviour and plot. Twenty-Fourth Annual Australasian Computer Science Conference, Australian Computer Society. pp29-37.

Garth Mason, G., Khoo, B., Bennetts, R., Cvejic, R., Uppal, T., Parr, S., Darby, M. and **von Kinsky B.** (In Press) Automated Optimisation of Federation Performance, SimTecT 2003, Adelaide, Australia.

Thesis in Progress

Doctor of Philosophy

Sule Nair

Thesis Title: The Formalization of Statechart Notation for Automated (Statechart) Validation

Thesis Passed

Doctor of Philosophy

Kamila Bartsch

Thesis Title: Semi automated consistency checking between use case scenarios and UML sequence diagrams.

Honours

Alex MacLennan

Thesis Title: A distributed approach to the analysis and visualisation of profiling data.

Travel

Brian von Kinsky

Australian Software Engineering Conference (ASWEC' 2001, Canberra, ACT, Australia).

