School of Information Technology and Mathematical Sciences

Research Newsletter

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INSIDE THIS EDITION:

A Few Words from the Acting School Research Coordinator.....

This is the time of the year when the main contingent of applications from new research students is being considered. Many prospective students nationwide have thrown their hats into the ring in an attempt to gain entry and scholarships for research degrees. We are in the process of updating and revamping our information on Research degrees with ITMS and this will be circulating for input and feedback

A good number of students have shown interest in the new proposal for an Honours degree and it is hoped that this can go ahead immediately.

In 1997 the Federal Government announced that it would fund 50 additional Australian Postgraduate Awards Industry (APAI) targeted to the fields of Information, Computers and Communication Technologies. The additional 50 awards will be available each year from 1999 to 2001.

This week Zhongwei Zhang will be presenting a paper on "Correction of Reflection Lines using Genetic Algorithms" at the SEAL (Simulation, evolutionary computing and Logic) conference in Canberra. Richard Hall will be presenting a paper on "Adaptive Simulation: An Implementation Framework" at the same conference.

Two of our research students are in the last stages of their PhDs. Lloyd Walker is to be seen at many parts of the university carrying boxes of drafts and Huifu Xu is in the very final stages of his writing up.
Richard Hall and two second year students attended the seminars at RMIT by Mannuela Velsis on the soccer playing robots.

Special Feature:

Impediments for Commercialisation of Research Results

Binh Pham attended a meeting in Melbourne on the 2nd of November 1998, organised by FASTS (Federation of Australian Scientists and Technologists Society) to discuss the impediments for commercialisation of research results in Australia. FASTS has been commissioned by DIST (Department of Industry, Science, Technology) to write a report on this problem. Three meetings were held in Melbourne, which brought together researchers at universities, CRC, CSIRO, and industrial representatives. Below is a brief summary of the main points of discussion:

- There are four sectors that need improvement: government, university, industry and the linkages between them.
- There needs to be a cultural change in the government and people's attitudes so that they value the invention of Australians.
- There is a need for government to define its goals in R&D and to create the right environment for innovation.
- Need to create the environment to help industry use R&D for their bottom-line; need some ways to compensate for defects within industry.
- Need to reconcile the expectations of students, universities, industries and governments – they all have individual agendas that overlap in some areas but not in others.
- If academic scientists are expected to commercialise their research work, they need to be trained in entrepreneurial and basic business skills.
- There needs to be recognition within the university system – "you can't have the rhetoric that says you have to be commercially focused but we'll only promote you only if you've got published papers."
- There has to be a strategy driving this process – country and industry strategic goals (eg. Oceans Policy)
- A few good goals promoted and advertised would help other goals as well – if chosen appropriately they would support a whole range of goals
- There is extreme apathy towards R/D on the part of industry.
- Need CEOs with vision!

Accepted Papers:

The paper " Lyapunov Sequences and a Turnpike Theorem Without Convexity" by **Z. A. Dzalilov, A. M. Rubinov** (University of Ballarat) and P. Kloeden (Johann Wolfgang Goethe University, Frankfurt, Germany) has been accepted for publication in the international journal "Set-Valued Analysis". The first version of this paper was published in the School Research Report series as Research Report 8/98, March 98.

Abstract: Turnpike theorems describe an asymptotic behaviour of efficient trajectories of dynamical systems of mathematical economics. We prove a new turnpike theorem for very general dynamical systems.

The paper "Equilibrium with Fixed Prices and Superlinear Connections" by **A. M. Rubinov** and B. M. Glover has been accepted for publication in the "Journal of the Australian Mathematical Society, series B". This first version of the paper was published as Research Report 6/97 in March 1997.

Abstract: We study models of economic equilibrium with fixed budgets and assuming superlinear connections between consumption and production. Extremal problems and existence of equilibria are discussed for such models along with related differential properties. Examples to illustrate the broad nature of the model are discussed.

The paper "Some Properties of Increasing Convex-Along-Rays Functions" by **A. Rubinov**, has been accepted for publication in the Proceedings of National Symposium "Functional Analysis, Optimization and Applications", University of Newcastle. The first version of the paper was published as Research Report 13/98.

Abstract: In this paper we extend the theory of real-valued increasing convex along rays functions for functions mapping into the semi-extended real line. We give a full description of the Fenchel-Moreau conjugate function to an increasing positively homogeneous of the first degree function.

Jack Harvey's paper "Application of Satellite Remote Sensing to Small Area Population Estimation" has been accepted for presentation at the International Association of Survey Statisticians (IASS) Conference on Small Area Estimation to be held in Riga, Latvia, in August 1999. This is a satellite conference of the 52nd Session of the International Statistical Institute, to be held in Helsinki, Finland, which Jack also plans to attend. The IASS conference will be attended by many demographic practitioners from national statistical agencies like the Australian Bureau of Statistics, and is aimed at improving knowledge transfer of new methods, particularly from the perspective of Eastern European countries and other countries undergoing change and development.

Research into population estimation by remote sensing methods has to date been conducted mainly by geoscientists - Jack is unaware of any other statistical specialist working in the field. Feedback from the conference organisers is that his paper is likely to be rather different thematically from the mainstream. He

anticipates conference participants will be interested both in the statistical technicalities of his methods, and in the potential for practical operational outcomes.

Postgraduate News:

A workshop on Air Pollution and Health Risk was attended by Post Graduate student, Dora Pearce, as it was highly relevant to the research currently undertaken for her PhD project. This one day workshop was held on 22nd October, as an adjunct to the Clean Air and Environment Conference '98.

Convened by Professor Tom Beer, CSIRO Division of Atmospheric Research, the workshop was supported by the Clean Air Society of Australia & New Zealand and the Australian Lung Foundation. Academics in the field of Public Health from local and interstate institutions, and representatives from the NSW Health Department and EPA, Victoria, gave expert presentations on risk assessment, air pollutants, health effects associated with ambient air pollution and epidemiological methods.

With environmental standard setting as the ultimate goal, health risk assessment procedures and data requirements were reviewed. The need for modelling criteria pollutants and hence accurate exposure estimates, and knowledge of associated health effects, to enable estimation of health risk associated with ambient pollution levels, were discussed. Accurate health risk assessment is a requirement for balancing the costs associated with ill-health and pollution reduction.

Current research into whether adverse health effects are due to ultra fine or respirable particles, the chemical composition of particles, or interactions between particles and other gaseous pollutants, was reviewed. Further discussion related to the complexity resulting from the variation in susceptibility of population subgroups, such as asthmatics.

It was observed that identification of threshold levels of effect for individual pollutants would simplify standard setting. However, epidemiological studies must unravel causal associations between various pollution levels and pollutant mixtures and diverse health outcomes ranging in severity.

Postgraduate Colloquium:

Heather Mays is scheduled to present "An Intelligent System for Algebra" on Monday the 20th November at 3:30pm in the ITMS Meeting Room.

Joe Zuoying will be presenting "Compression of Images using a Facet Model" on Monday the 7th of December at 4pm in the ITMS Meeting Room.

All ITMS Staff and Postgraduates are encouraged to attend Post Graduate Colloquia sessions.

All IT&MS staff members and postgraduate students are encouraged to contribute to the next edition of the monthly ITMS Research Newsletter. Examples of newsletter items staff should consider are: projects in process, papers accepted, research in process, publications, grants, seminars, visitors, visits by ITMS staff and Post graduates, scholarships, reports from school research groups / centres, events, conferences, new discoveries, general items of interest, etc. All items should be received by Kirsty Broadbent no later than the 15th November 1998.

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