



Research Newsletter

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Edition 13

Inside this Edition:

Multidisciplinary Research Project

A new numerical method for
global optimization project

Accepted Papers

Published Papers

On-line conference

Seminars

International e-Workshop: Developing

Online Tutors.

Post Graduate News

Submitted School Grants

Research Reports

J McDonald, T Hastings and J Harvey P1

Alex Rubinov & Adil Bagirov P1

P1 & P2

P2

Lyn Roberts P2

P3

Lyn Roberts P3

P3

P4

P4

Projects in Progress

Multidisciplinary Research Project

The school of ITMS has become involved in a very interesting and challenging multidisciplinary research project being undertaken by PhD student **Michael Gathercole**. Michael, who has a background in the social sciences and in health management, is investigating various aspects of the concepts of human progress and well-being, and attempting to devise indicators which are broader and more inclusive than the usual narrowly defined economic measures such as gross national product. Michael is being jointly supervised by Dr John McDonald of the Centre for Rural Health, Assoc Prof Trevor Hastings of the School of Business, and Dr Jack Harvey of ITMS.

A new numerical method for global optimization, which is called the cutting angle method, was developed at the University of Ballarat in 1997. Last summer **Alex Rubinov** and **Adil Bagirov** substantially improved this method with new improvements and modifications. They also

introduced a combination of the cutting angle with a local search. Results of numerical experiments which were carried out by Adil, demonstrate that the cutting angle method becomes a powerful tool for solving many difficult problems of global optimisation, including nonsmooth problems of a fairly high dimension.

Accepted papers....

The following papers have been accepted for publication in international journals:

The paper **Algebraic Insight and Students' Use of Derive** by **Robyn Pierce** has been accepted for the 4th International DERIVE/TI89 conference on computer algebra in mathematics education, Liverpool UK July 2000.

The paper **Generic power convergence of order-preserving mappings, Nonlinear Analysis** by **S. Reich, A.M. Rubinov, A.J. Zaslavski** has been accepted for the Theory, Methods and Applications Journal.

A significant part of this paper was prepared during the visit of Alex Zaslavski to the School of ITMS in 1997.

The paper **Difference inclusions with delay of economic growth** by **Z.A. Dzalilov, A.F. Ivanov and A.M. Rubinov**, has been accepted by *Dynamic Systems and Applications*.

The paper **Best approximation by normal and conormal sets** by **A. M. Rubinov and I. Singer**, has been accepted to appear in the *Journal of Approximation Theory*.

The paper **The Dependency of Discretion and Consistency on Knowledge Representation** by **Stranieri, A. Yearwood, J. L. and Meikle, T. Z** has been accepted by the *International Review of Law, Computers & Technology 2000*.

Published papers....

The following papers have been published in international journals:

A.M. Rubinov, Abstract convexity: examples and applications, *Optimization*, vol. 47 (2000), pp. 1-33.

This paper contains many non-trivial examples of abstract convex functions and sets and also many new applications.

A.M. Rubinov, B.M. Glover and X.Q. Yang, Decreasing functions with application to penalization, *SIAM Journal Optimization*, vol. 10 (2000), pp 289-313.

The first version of this paper was prepared in 1997. The paper describes a new approach in the study of penalization, which is based on abstract convexity.

John Yearwood and Binh Pham, Case-based Support in a Cooperative Medical Diagnosis Environment. (Ed) Rashid L. Bashshur *Telemedicine Journal 6(2) 2000*.

Pham, Binh and Yearwood, John, Delivery and Interactive Processing of Visual Data for a Cooperative Telemedicine Environment. (Ed) Rashid L. Bashshur *Telemedicine Journal 6(2) 2000*.

Following **Dr Jack Harvey's** presentation of an invited paper at the International Association of Survey Statisticians (IASS) Conference on Small Area Estimation held in Riga, Latvia in August 1999, Jack's paper "**Small Area Population Estimation Using Satellite Imagery**", which presents an overview of his recently completed doctoral research, has now appeared in the journal *Statistics in Transition*, which is published by the Central Statistical Office of Poland, and which specialises in methodological research relevant to national statistical agencies in Eastern European countries and other countries undergoing change and development.

The school of ITMS has become involved in a very interesting and challenging multidisciplinary research project being undertaken by PhD student Michael Gathercole. Michael, who has a background in the social sciences and in health management, is investigating various aspects of the concepts of human progress and well-being, and attempting to devise indicators which are broader and more inclusive than the usual narrowly defined economic measures such as gross national product. Michael is being jointly supervised by Dr John McDonald of the Centre for Rural Health, Assoc Prof Trevor Hastings of the School of Business, and Dr Jack Harvey of ITMS.

Conferences.....

On-line conference

Lyn Roberts participated in the Fifth Annual Teaching in the Community Colleges Online Conference, "A Virtual Odyssey: What's Ahead for New Technologies and Learning." This was run from Hawaii from

April 12th to 14th. Keynote addresses and papers were posted to a password-protected site. There was also opportunity to participate in live chat sessions, but these mainly ran between 2 and 5 am Australian time! While there were some very interesting and useful papers, it was not as good as attending a live conference.

Seminars

Dr Ken Harvey presented a seminar on Wednesday March 22nd 2000 "**The SPIRT I Pharmaceutical Decision Support Project**" which summarised: how medication could be improved by computer-assisted pharmaceutical decision support systems that use national information resources such as Therapeutic Guidelines and what is required for this to happen.

On March Thursday 30th **Alex Rubinov** presented a seminar at the Mathematical Division of LaTrobe University, Bendigo campus. Alex had fruitful discussions with Professor Terry Mills and Dr. Rob Champion.

La Trobe, Bendigo is very similar to Ballarat University and has similar problems.

On Wednesday the 17th May **Jack Harvey** presented a seminar '**A Tale of Six Cities: Estimation of Australian populations from satellite imagery**', in which he outlined the essential kernel of innovation in his PhD thesis and the results of applying his methodology to estimating the population of six Australian cities.

Workshops

International e-Workshop: Developing Online Tutors.

Lyn Roberts submitted a case study to this workshop. It was accepted by three referees, and Lyn is now one of approximately thirty participants worldwide.

She will take part as an author between the 8-12 of May. The output of the e-Workshop will be a widely-disseminated compendium of illustrative case studies and practical guidelines and strategies for tutors and staff developers working in the global on-line environment.

Post Graduate News....

Robyn Pierce has been successful in her transfer from probationary candidature to full PhD candidature at the University of Melbourne. Robyn's thesis looks at algebraic insight and the use of computer algebra systems.

Chris Turville submitted his PhD to The University of Western Sydney Macarthur, entitled 'Techniques to Handle Missing Values in a Factor Analysis' in March. It is currently under examination.

Tunde Meikle has been successful in her transfer from probationary candidature to full PhD candidature at the University of Ballarat. Tunde's thesis looks at Automating Support for Discretion and Consistency in Legal Decision Support Systems and is a SPIRT grant with the Refugee Review Tribunal of Australia.

Scholarships/Awards....

An **Aspect Computing** scholarship to the value of \$1,000 was awarded to **Dean Parish** who is a third year Bachelor of Computing student.

Robyn Pierce has been awarded a **Melbourne Abroad Travel Scholarship** to support her trip in July to meet various other academics researching the use of computer algebra systems in teaching mathematics (Josef Bohm - Austria, Neil Callis, John Berry, John Monaghan - UK) and present a paper to the 4th International DERIVE/ T189 conference to be held in Liverpool 12-15 July.

School Grants:

The table below shows the national competitive grant applications submitted from the School this semester.

Agency	Year	Project team	Project title/Description	Amount	Progress
ARC Large	2001	Alex Rubinov	Monotonic Analysis and its Applications.	\$267,932	Submitted
ARC Large	2001	Anatoli Ivanov	Qualitative Analysis of Delay Differential Equations.	\$256,825	"
SPIRT Project	2001	K.Harvey/Rubinov /Yearwood/J.Harvey	Enhanced prescribing decision support: data mining the Australian adverse drug reactions database and providing on-line access to information.	\$292,626	"
SPIRT APA(I)	2001	Alex Rubinov	Optimisation of capital and operational expenditures for a telecommunication network.	\$70,770	"
SPIRT APA(I)	2001	Paul Kelly & Lyn Roberts	Matching the academic mindset with on-line teaching.	\$70,770	"
SPIRT APA(I)	2001	John Yearwood	E-Tourism: An application of dialogue based argumentation for tourism	\$70,770	"

Three SPIRT APA(I) applications and one project application (jointly with LaTrobe University) have been submitted from the school. If these were all successful then there would be 6 APA(I) scholarships for next year. This is an excellent effort from all staff involved.

Research Reports

00/6	A method of truncated codifferential with application to some problems of cluster analysis ¹	V.F. Demyanov ² A.M. Bagirov and A.M. Rubinov	March 2000
00/7	Abstract convexity of positively homogeneous functions ¹	A. Rubinov and Z. Dzalilov	March 2000
00/8	Cutting angle method in global optimization: theoretical and numerical analysis ¹	A.M. Bagirov and A.M. Rubinov	May 2000
00/9	The dependency of discretion and consistency on knowledge representation ¹	Andrew Stranieri, John Yearwood, Tunde Meikle	May 2000
00/10	Case-based Support in a Cooperative Medical Diagnosis Environment ¹	John Yearwood ¹ & Binh Pham ²	May 2000
00/11	Delivery and Interactive Processing of Visual Data for A Cooperative Telemedicine Environment	Binh Pham ¹ & John Yearwood ²	May 2000
00/12	Asymptotic Behaviour of Nonoscillatory solutions of Systems of Quasilinear Neutral Differential Equations	Anatoli F. Ivanov ¹ , Pavol Marusiak ²	May 2000

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 Maxine Kingston no later than the 20th August 2000.



University of Ballarat



School of Information Technology & Mathematical Sciences, University of Ballarat.