School of Information Technology and Mathematical Sciences

Research Newsletter

November 2001   **Edition 18**

* * * * *

Now you can access the Newsletter on the Web at
http://www.ballarat.edu.au/itms//research

*****

The School Welcomes .....

Professor Sidney Morris who started his appointment with ITMS on the 1st November and staff are looking forward to working with him.

Congratulations .....

David Stratton and **Dr Phillip Smith** have been successful with two research tenders from the DSTO. The projects will help establish research into the High Level Architecture (HLA) and Distributed Simulation at the University of Ballarat. The first project involves "Approaches to HLA FOM Agility: Software Library", ($65,000) and "Approaches to HLA FOM Agility: Data Specification" ($45,000).

The University of Ballarat will develop a software library that has an identical application programming interface to HLA's Run-Time Infrastructure (RTI) and that can perform object model mapping/translation between the simulation code (federate) and the RTI proper. This library, known as a

proxy, can potentially be used as a drop-in supplement to the RTI proper on existing legacy systems to provide for future re-use and refactoring, and adaption to alternate distributed simulation infrastructures.

Large ARC Grant .....

Dr **John Yearwood** and Dr **Andrew Stranieri** were awarded an ARC discovery grant of more than $320,000 over 5 years for the Discovery Project *'Mapping argumentation structures to narrative for eCommerce dialogue support'*.

Adil Bagirov has been appointed Postdoctoral Fellow in the Centre in Applied Optimisation. Adil will further his work in applying optimisation methods to data mining and computational chemistry.

Professor Polak's Visit .....

Professor Lucien Polak is an outstanding expert in the field of optimization. He is a survivor of the Nazi Holocaust and his mother who was the only survivor in his family, immigrated to Australia without money. Lucien missed regular high school education, however he was able to obtain his B.Ed at the University of Melbourne. He then went to the USA and obtained his PhD

degree at the University of California, Berkeley in 1961. Eventually he became a professor in that world-class university. Lucien often visits the University of Melbourne and during his visit in August-September, this year, he spent a day in Ballarat, where discussions with Alex Rubinov and Adil Bagirov were held. Lucien has invited Alex to visit the Department of Electric and Electronic Engineering at the University of Melbourne, for further informal discussions. Lucien was interested in optimization methods developed here and confirmed that these methods can be used in the study of many engineering problems.

Research training: Bayesian Methods Study Group ….

A study group has begun meeting weekly with the aim of developing knowledge and skills in the area of Bayesian analysis, a modern research tool for data mining and statistical modelling. The group is led by Jack Harvey, who last December attended an intensive course in Bayesian methods conducted by internationally eminent practitioners in the field. Jack is supervising two postgraduate students (Dora Pearce and Simon Barty) whose projects are amenable to Bayesian methods. The 15 study group participants include staff and postgraduate students from all discipline areas in the school.

Book chapter….

Jack Harvey has been invited to contribute a chapter on his research work relating population and satellite imagery to a forthcoming book entitled "*Remotely Sensed Cities*", to be published in the UK by Taylor and Francis.

Accepted papers….

Margaret Kendal, Kaye Stacey and **Robyn Pierce** have written a chapter '*New Work Plans in the Classroom*' which has been accepted to appear in *Calculatrices symboliques. Transformer un outilen un instrument du travail mathématique : un problème didactique* Editors: Dominique Guin and Luc Trouche (equipe ERES, Montpellier 2). Publishers: La pensee sauvage editions, recherche en didactique des mathematiques, (collection dirigee par Nicolas Balacheff).

David Stratton has had two papers accepted for the International Conference on Computers in Education in Seoul, Korea in November. One is jointly authored by Dr Philip Smith and David Stratton and entitled "*Incorporating GUI Builders into Introductory Programming Courses*". In this paper they state the case for including GUI-building in introductory programming Units and evaluate 4 different language/GUI builder combinations.

The second paper, '*A Program Visualisation Meta-Language Proposal*' encapsulates David Stratton's DIT Confirmation and argues for the development of PVML.

J.E. Martinez Legaz, A.M. Rubinov and **I. Singer**, *Downward sets and their separation and approximation properties*, has been accepted to appear in the *Journal of Global Optimization*.

A.D. Ioffe and **A.M. Rubinovs'** paper, *Abstract Convexity and Nonsmooth Analysis. Global Aspects*, has been accepted to appear in Advances in Mathematical Economics.

Published papers ….

The following papers have recently been published:

A paper by **Robyn Pierce** '*Using CAS-calculators requires Algebraic Insight*' has been published in the Australian Senior Mathematics Journal volume 15 number 2:

Robyn Pierce and **Kaye Stacey** (University of Melbourne) paper: *Reflections on the Changing Pedagogical use of Computer Algebra Systems: Assistance for Doing or Learning Mathematics* in the Journal of computers in Mathematics and Science Education Volume 20 number 2 pp143-161.

H.Tuy, A.M. Bagirov and **A.M. Rubinovs'** paper, *Clustering via D.C. Optimization, In: Advances in Convex Analysis and Global Optimization* has been accepted to appear, N. Hadjisavvas and P. Pardalos- eds., Kluwer Academic Publishers, 221-224, 2001.

This paper was prepared during Professor Tuy's visit to Ballarat.

A.M. Bagirov and **A.M. Rubinovs'**, *Modified versions of the cutting angle method*, has been accepted to appear in: Advances in Convex Analysis and Global Optimization, N. Hadjisavvas and P. Pardalos- eds., Kluwer Academic Publishers, 245-268.

The paper contains a detailed presentation of the cutting angle method.

A.M. Bagirov and **A.M. Rubinov's** paper *Global optimization of marginal functions with applications to economic equilibrium*, Journal of Global Optimization, vol. 20, 215-237. (2001).

Global maximization of marginal (optimal value) functions is a very difficult problem. It is proposed to use the cutting angle method for solving this problem. This

approach has been applied in the study of economic equilibrium.

Z.A. Dzalilov, A.F. Ivanov and **A.M. Rubinov**, Difference inclusions with delay of economic growth, *Dynamic Systems and Applications*, vol. 10 , 283-293 (2001).

Some methods of the economic dynamics have been applied in the study of certain difference inclusions with delay.

A. M. Rubinov, Abstract convexity, global optimization and data classification, *Opsearch*, vol. 38, 247-265 (2001).

This survey paper has been published in the leading Indian journal in the area of optimization and operation research.

A. M. Rubinov, Nondifferentiable optimization: Newton's method, *Encyclopaedia of Optimization*, C.A. Floudas and P. Pardalos (eds), Kluwer Academic Publishers, 2001.

A. M. Rubinov, Global optimization: envelope representation, *Encyclopaedia of Optimization*, C.A. Floudas and P. Pardalos (eds), Kluwer Academic Publishers, 2001.

Encyclopaedia of Optimization (in 6 volumes) was published this year by Kluwer Academic Publishers. This book is very useful for experts in the field, however its price is US$1300 (Contributors special price is US$800).

Avery, J., Yearwood, J. L. and **Stranieri, A**. (2001) An Argumentation Based Multi-agent System for eTourism Dialogue. In Proceedings of The International Workshop on Hybrid Systems, Adelaide, December.

Mammadov, M. and **Yearwood, J. L.**, (2001) An Induction Algorithm with Selection Significance based on a Fuzzy Derivative. In Proceedings of The International Workshop on Hybrid Systems, Adelaide, December.

Yearwood, J., Stranieri, A. and **Avery, J**. (2001) Negotiation and Argumentation Based Agents to Facilitate eCommerce, In *Proceedings of the International Conference on Advances in Infrastructure for Electronic Business, Science and Education on the Internet, SSGR 2001*, L'Aquila, August 6-12, pages 100-109.

Seminars and Workshops.....

Forthcoming Seminars ....

24/10/01 –
Wendy Rodgers (Hons)
7cd88f09264a33dd
Amy Turnbull *'Explorations in Program Visualisation'*.

31/10/01 –
Kylie Pegg (Hons) *'The effect of Limited Programming Experience on the Learning of an Object Oriented Programming Language'*
.
Stephen Halliday (Hons) *'Pair Programming'*.

David Andrews (Hons) *'Semi-Distributed Security Architecture in HLA and its Effect on Simulation Performance'*.

7/11/01 (Staff)
Professor **Alex Rubinov** *'The Centre in Applied Optimisation (CiAO)'*.

21/11/01 (Staff)
Lyn Roberts *'Using Web-based Resources to Teach Taylor Series'*.
Robyn Pierce '*A Frame Work for Algebraic Insight'*.

5/12/01
Michelle O'Brien (PhD) *'Decision Support Systems in Medicine – an overview'*.

Conferences.....

SSGRR 2001
John Yearwood attended SSGRR the International Conference on Advances in Infrastructure for Electronic Business, Science and Education on the Internet. The conference was held at Scuola Superiore G.Reiss Romoli in the city of L'Aquila about 100 km west of Rome in August this year. The venue is a commercial IT School sponsored by Telecom Italia. He presented a paper entitled *'Negotiation and Argumentation Based Agents to Facilitate eCommerce'*

ASOR Conference
The 16th National Conference of The Australian Society for Operations Research was held in McLarens on the Lake Resort, South Australia from September 23 till September 26. Some members of CiAO (Centre in Applied Optimization) attended this conference and presented talks. The following is the list of the talks presented:

A.Bagirov, L. Churilov (Monash University) M. Mamedov, A. Rubinov: *Iso-resourse Grouping for Acute Health care in Australia: A global optimisation based clustering approach.*

A.Rubinov *A Global Optimization Approach to Data Classification. I: Methods.*

A.Bagirov *Global Optimization Approach to Data Classification.II: Implementation and results of numerical experiments.*

M. Mammadov *Sequential Separation of Sets with a Given Accuracy and its Applications to Data Classification.*

7th Optimization Day - Mini-Conference
The 7th Optimization Day mini-conference followed the ASOR conference was held on September 27. The University of Ballarat hosted the 6th Optimization Day conference in 1999. **Alex Rubinov** presented the only invited lecture at this meeting. The title of his lecture: *Abstract convexity and Global Optimization* .

The following talks were presented:

A.Bagirov *Comparison of two approaches in nonsmooth optimization;*

M. Mammadov *Asymptotical Stability of Optimal Paths in non-convex problems.*

Proceeding of the mini-conference will be published as a monograph by Kluwer Academic Publishers.

Meeting of the Computational Chemistry Group .....

Present: Alex Rubinov, Adil Baghirov, Marcello Bertoli (University of Ballarat) Kai Ming Ting (Monash University) , Kieran Lim, Gleb Belyakov, Lynn Batten (Deakin University)

The group convened between 10:15 and 10:30 in A209, Rusden campus for tea and coffee.

At 10:30, **Marcello Bertoli** reported on the work he has accomplished since starting in the position.

At 11:30, Kai Ming reported on his work with Manzur. They have shown that re-distribution of an unbalanced load can be done in $O(n^{k+2}/\sqrt{m})$. Here m is the number of processors. Gleb then told us that he had been able to prove that at each stage in the graph resulting from the algorithm, that at most n nodes split off at each stage. Hence step 3 is of order $O(nk^2)$ and step 4 of order $O(n^2)$. Gleb will write out his proof and circulate it.

The general consensus was that these were excellent improvements and will speed up the tuning time a great deal (in conjunction with Fibonacci Heap software).

After lunch Alex spoke about the minmax problem, pointing out that this is a very time-consuming issue. Currently the cutting

angle is the only method for solving some of these problems. Kieran next told us of a presentation at the Brisbane conference by a Swiss pharmaceutical company representative. The problem was one of clustering molecules into ellipsoid-like shapes. Gleb pointed out that the k-ellipsoid method is known and is very

difficult. However, it was felt that we might at some point like to tackle the problem once our code is running. In particular, Alex suggested that Adil's local search package might work well.

The discussion then turned to grant applications.

The next meeting will be held towards the end of November or very early December at Ballarat. A subsequent one in late February in Gippsland.

Post Graduate News.....

Robyn Pierce has submitted her Ph.D. thesis on '*An exploration of Algrebraic insight and effective use of computer Algrebra systems'*.

Congratulations to **Lloyd Walker** who has been granted the degree of Doctor of Philosophy his thesis was titled '*Efficient data structures for modelling the combination of three dimensional DTM and CAD data* '.

Congratulations to **Mikhail Andramonov** who has also been granted the degree of Doctor of Philosophy, his thesis was titled '*Global minimization of some classes of generalized convex functions*'.

Congratulations to **Musa Mammadov** who's confirmation of candidature was approved. Musa is engaged in the study of '*Fuzzy Derivatives in Dynamics and Classification'* he presented a paper titled '*Fuzzy Derivative and Dynamical Systems'.'*

Welcome to **Jaipu Zhang** who is doing a PhD degree under the supervision of Alex Rubinov. His project is on '*Optimization problems in Telecommunication networks'*.

Research Reports

01/16	A method for minimization of quasidifferentiable functions	Adil M. Bagirov	August 2001
01/17	The Equivalence of Nonlinear Convolution Functions	A.M. Rubinov and Rafail N Gasimov	October 2001
01/18	Lagrange-type functions in constrained optimization	A.M. Rubinov and J.S. Giri	October 2001
01/19	On Global Minimiser Conditions based on Separability by a cone	A.P. Shveidel	October 2001
01/20	Lagrange-type Functions in constrained Optimization	A.M. Rubinov, X.Q. Yang, A.M. Bagirov and R. Gasimov	October 2001
01/21	The zero duality gap property and lower semicontinuity of the perturbation function	A.M. Rubinov, X.X. Huang, and X.Q. Yang	October 2001
01/22	Continuous subdifferential approximations and their applications	A.M. Bagirov	November 2001
01/23	On minimization of max-min functions	A.M. Bagirov and A.M. Rubinov	November 2001

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 June 1999.

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