CACSD Plenary 1 Adriano Cavalcanti Da Silva **Date:** Wednesday 18th September 2002
Lomond Auditorium, 05.45 p.m.

Address: Fraunhofer Institute for Computer Graphics
Rundeturmstr. 6, Raum 109
D-64283 Darmstadt
Germany

Title: Neural Motion and Evolutionary Decision in Robotic Competition Applied for Molecular Machine System Design.

Abstract:

The author presents a new approach within advanced graphics simulations for the problem of nano-assembly automation and its application for nanomedicine. The problem under study concentrates its main focus on the design of autonomous nanorobots for assembly manipulation and the use of evolutionary competitive agents as a suitable way to warranty the robustness of such proposed model. Furthermore the work presents also the use of neural networks as the most practical approach for the problem of robot motion optimisation using a sensor based system. Thereby the paper addresses distinct aspects of the main techniques required to achieve a successful nano-planning system design and its simulation with a real time 3-D visualization.

Biographical sketch:

Adriano Cavalcanti is a member of the technical staff at Fraunhofer Institute for Computer Graphics at Darmstadt, where he has been developing works on several research projects related to virtual reality, autonomous systems, parallel processing, and 3D physically based simulation. He holds a B.S. in Computer Science from State Sao Paulo University, and a M.S. in Electrical and Computer Engineering focusing on automation and control from Campinas State University, Brazil. He is currently a Ph.D. student in the Computer Science Department at Darmstadt University of Technology, Germany.

CACSD Plenary 2 Barry Lennox

Date: Thursday 19th September 2002
Lomond Auditorium, 08.45 a.m.

Address: Control Technology Centre Ltd.,
School of Engineering,
University of Manchester, UK

Title: Recent experiences in the industrial exploitation of principal component based fault detection methods

Abstract:

There has been a plethora of research and many industrial studies involving the application of multivariate statistical techniques for the detection and isolation of faults on process plants. Despite all this work, and reported success of the studies, there remain very few on-line applications of the technology. To address this issue and to determine the capabilities and limitations of the multivariate statistical techniques, the Control Technology Centre Ltd. has undertaken a comprehensive study aimed specifically at the development of on-line multivariate solutions for process plants. This paper provides details of several of these investigations. These investigations have highlighted a number of factors which should be considered when conducting multivariate analysis. For example, there appears to be a need for consideration of cause and effect relationships, which is often ignored in other application studies. In addition the integration of the multivariate statistical routines into a hierarchical system is demonstrated to provide the potential for robust and self-diagnosing control systems.

Biographical Sketch

Barry Lennox received a BEng in Chemical and Process Engineering and a PhD from the University of Newcastle in 1991 and 1996 respectively. He has worked as a Process Engineer for Esso Petroleum and MW Kellogg Ltd. Since 1997 he has been a lecturer, and more recently a Senior Lecturer, in Industrial Control Engineering at the University of Manchester. He is a research consultant for the Control Technology Centre Ltd, a Chartered Engineer and Member of the Institute of Measurement and Control. His research interests are in the application of mutlivariate process monitoring and control technologies.

CACSD Plenary 3 Paul C. Austin **Date:** Thursday 19th September 2002
Lomond Auditorium, 01.00 p.m.

Address: Business Development Manager APC Pulp & Paper
Invensys Performance Solutions EMEA

Title: Applications of Model Predictive Control in the Paper Industry

Abstract:

In the paper industry over the last decade, big companies have become bigger and smaller companies have become absorbed into larger groups or have become more specialised. The increased competition that is driving developments in all these companies is leading to greater emphasis on continuous improvement of product quality, increases in product throughput and profit maximisation through optimisation of operations mill-wide.

The process plants of most paper companies that have survived into the 21st century are controlled by quite modern DCS systems located in central control rooms. However the control algorithms used are typically based on traditional single loop three term controls. Increasingly, these control strategies are found to be not sufficiently sophisticated to meet modern-day process demands described above. Because they do not comprehend the multivariable character of the plant, significant plant variation can occur in important quality parameters. Furthermore, three term controls are unable to ensure the plant is operated strictly within specified limits, and they have no optimisation capabilities either for determining optimal regions of operation or for maximising production subject to specified constraints.

These areas of limitation of traditional three term controls are the strengths of modern Model Predictive Controls (MPCs). MPCs found their way into the process industries through the oil and petrochemicals sector, where MPC is now a fairly mature technology. MPCs are just beginning to find their way into the paper industry.

This paper will describe some new applications of MPC to paper machines and to pulp mills. Some indications are given of the scale of the benefits MPC can offer in these new applications, and of the nature of the changes in operating philosophy that MPC implementations in the paper industry can bring about.

Biographical Sketch:

Paul was born and grew up in New Zealand, where in 1970 he completed a BE(Chem) at Canterbury University while working at Tasman Pulp and Paper Company. His studies at Canterbury and experiences at Tasman fostered an interest in process control, which he pursued by completing a PhD in advanced control systems theory at Cambridge University, England.

This lead to employment as a university teacher and researcher, both in Britain but mostly in NZ. However, for the last decade he has been particularly interested in designing and implementing advanced process control systems that will deliver performance and profitability improvement in the chemical process industries, specially in the pulp and paper industry. In doing this he has worked for several UK-based consulting engineering companies, first for Cambridge Control, where he was a Director from 1994 – 1996, then for AspenTech and most recently for Invensys, in their Performance Solutions Group. He has been responsible for developing some of the first applications of advanced control for wet end stability improvement in paper machines and for optimisation and better regulation of de-inking plants using advanced controls.

Paul is a Fellow of the Institution of Professional Engineers NZ and is the author of a number of refereed papers and journal articles on theoretical and applied aspects of systems modelling and advanced control systems design. He is married and has three teenage children.