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## Applied Control Technology Consortium

Improving Performance through Understanding and Application of Control Technologies

### E-News July 2005 Edition

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#### ACTC News

##### ACTC Servomechanism Training Course, Glasgow



The ACTC recently held (22 July 2005) a scheduled training

course in Glasgow on "Control Design for Servomechanisms". This three-day course provides an introduction to the fundamentals of control design, covering practical aspects such as the effect of discrete (digital) control, controller tuning and servo testing and system identification. The course was attended by delegates from ACTC member companies Rolls-Royce Marine, Ford and Ministry of Defence, and also delegates from non-member companies Saibos and Vinten. The delegates were even treated to dinner with Professor Mike Grimble as a reward for their hard work on the course.

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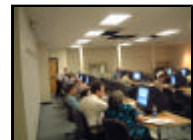
##### ACTC Training at Ford Motor Company Ltd., USA



There was excellent feedback from the recent "Advanced Control for Automotive Applications" course held in Ford Motor Company Ltd, USA (22 June 2005). The hand-on sessions were well received and as usual, Andy Clegg had orchestrated all of the talks / examples very well.

Also present was Arek Dutka who has just completed his PhD on an automotive project. Arek was able to talk with the engineers more meaningfully regarding the applications questions raised. It was also very helpful to have the guidance of Jeff Cook, Ford Motor Company Ltd., USA who was kind enough to introduce or sit in several of the sessions.

We were able to discuss with Jeff some of the lessons learned in areas where other training opportunities lay.



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##### ICC Advances in Non-linear Control and Success in New Initiatives

The Industrial Control Centre at the University of Strathclyde works very closely with the ACTC. It has recently been awarded a prestigious five year platform grant programme in non-linear industrial control with particular emphasis on real-time control implementation.



The project was supported by a number of international companies

including National Instruments, Austin, Texas. The program will run for a five year period, as the present platform grant programme which covered a four year period is now drawing to a close. This programme was very successful and was perhaps one of the reasons why the new project was approved.

In the existing programme a new form of practical non-linear control algorithm was developed that can deal with grossly non-linear systems. This has resulted in international interest. A recent tour of the United States involved seminars at three Universities, two companies and a plenary presentation at a conference.

The non-linearities in systems are often a limiting factor on performance. Rapid progress has been made on the design of controllers for multivariable industrial processes and with enough effort most systems that are dominantly linear can be tuned to give reasonable performance. However, systems that have severe non-linearities cannot be improved beyond a certain point using only linear techniques. The consequence is that performance is limited leading to poor product quality or system performance.

A new suite of software tools has been developed to enable the new algorithms to be applied in practice. Extensive testing has been performed so that it is believed that these algorithms are now ready for use in industry. A workshop will be held in about a year's time to introduce the new design procedures and ACTC members will receive copies of design tools. The ACTC is a partner in both the original platform grant programme and the new programme.

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### **ACTC Energy, Oil & Gas SIG Meeting: "Condition Monitoring & Safety Systems for Power & Process Plant"**



This event, held on 19 May 2005, was kindly hosted by RWE Npower at their Workshop and Training Centre in the shadow of Ferrybridge PowerStation near Leeds. The meeting was attended by a small but energised group, representing a good range of companies including the hosts, BP, Corus, EON Power Technology Centre, Scottish and Southern Energy, Alstom, Yorkshire Water, Emerson Process Management and Open Automation and Control.

The morning was devoted to condition monitoring systems and techniques. Alstom demonstrating their AMODIS system for remotely analysing data from gas turbine power plant. Euan Davidson of Strathclyde University described intelligent multi-agent based techniques used by Scottish Power to identify faults in power networks. In the afternoon, the topic changed to safety systems and standards. Peter Wyman of RWE Npower provided a very enlightening example of undertaking a quantified list assessment on a feed heater. The day was broken up by a tour of the impressive workshop facilities, where various power plant components (valves, gas turbines) get re-furbished by RWE Npower.

As is usual at ACTC events, the usefulness of the day was demonstrated by the lengthy questions and answers after each presentation. The ACTC would like to thank everybody who attended for contributing so enthusiastically. ACTC members can access the presentations on this event via our web site.

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### **Free Fuzzy Software - Really!**

A few years ago, Dr Bruce Postlethwaite and a few colleagues at Strathclyde University tried to put together a spin-off company to develop and sell fuzzy modelling and control software. The technical side went well - several innovation awards were won. However, the commercial side was a bit of a disaster!

Rather than seeing the software going mouldy, Dr Postlethwaite has decided to release it. It is completely free - also completely unsupported.

There are three packages currently available:

- CybMod - which identifies and tests relational fuzzy models;
- CybFIMC - which takes the CybMod models and incorporates them into an IMC controller structure;
- RuleEngine - which is an Excel based fuzzy rule development package.

All software comes with documentation. Please [contact Dr Postlethwaite](#) directly for further

information.

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### **Alstom/ACTC Rolling Mill Academy, Pittsburgh, USA**



great

success, with over 65 delegates attending. Mike Grimble, who established the first course back in 1998, was present and delivered the introductory control course as well as an overview of advanced control for strip mills.

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### **ACTC Delivers "Total" Training**

Andy Clegg delivered the popular "Introduction to Process Control" training course at Total Oil Refinery, Immingham on 5 April 2005.

This one-day course was attended by 17 trainees ranging from apprentices to operations staff to control engineers. The course was very received and it is hoped that this, the first course for Total, will be repeated.

This course can now be delivered to ACTC members either entirely as a lecture based course, or incorporating extensive computer-based learning and hands-on depending on the need of the company. For details of the course agendas please go to:

[http://www.actc-control.com/act\\_training.html](http://www.actc-control.com/act_training.html)

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### **ACTC Meeting: "New Developments in Real Time Control for Automotive Systems", Dearborn, USA**



A meeting of the automotive special interest group was held at the Marriot, Dearborn Inn in Dearborn, Michigan during February. Detroit is of course the centre of the US automotive industry and the event was very well attended. The ACTC and National Instruments jointly hosted the meeting. The event began with an introduction to the ACTC entitlements and services followed by a perspective on real-time and advanced control by Jeff Cook of Ford Motor Cooperation. Dr Cook heads one of the leading international research and development groups on automotive systems and he provided a stimulating introduction to the problems and advances.

Kim Langford of National Instruments introduced the new NI integrated design, simulation, and real time control tools that are particularly appropriate for industries like automotive and aerospace. The was followed by a presentation by Raymond Turin of Simuquest Inc on Virtual design concepts for embedded engine control application control. There is significant interest in embedded systems for automotive applications and this has implications fort he development of algorithms and techniques for implementation.

Ardalan Vahidi of the University of Michigan presented work on fuel cell control, which is also an area of rapid development. He discussed the control problems in fuel cells for automotive applications including computational and real time aspects.

Lunch was followed y a demonstration of the new control and simulation toolboxes that are

suitable for total integrated solutions by Kim Langford. It is likely to save considerable time and aggravation in having complete design, simulation, and real time control and implementation facilities within one total environment. An example of using the National Instruments labview products for the control of a TIVCT engine was presented by Arek Dutka of the ACTC that is the results of the one of the case studies undertaken.

New development in advanced control for automotive systems was presented by Mike Grimble (University of Strathclyde) and this talk mostly focused on the problems of designing control systems with dominantly nonlinear plants. The applications of interest included powertrain controls where significant non-linearity's limit performance. The final session involved a round table discussion chaired by Jeff Cook (Ford) on the way ahead for the ACTC automotive training and development program. It was heartening to observe that the delegates had strong views regarding future directions and the responses after the meeting were uniformly good. Planning is now in place for meetings of the ACTC automotive SIG both in the UK and again in Detroit.

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