

Control and ID Matters



*The Quarterly Newsletter of the Centre for Distributed Automation and Control
March 2004*

Welcome to CDAC

The Centre for Distributed Automation and Control

Welcome to the first CDAC quarterly newsletter. The newsletter aims to update on research activities here at Cambridge as well as providing practical information on events, developments and products that impact on industrial automation and control. CDAC is one of seven research centres in the Institute for Manufacturing (IfM) at the University of Cambridge. A major focus of the Institute is to bridge the gap between academic research development and industrial practice, and CDAC provides this support for the automation and control community. In particular, CDAC focuses on effective control solutions for operations subject to frequent disruption or long-term systemic change. The centre has developed a suite of approaches for both analysing and improving operations whose physical performance is apparently at odds with that predicted by its information management system.

Our research in this area spans the entire supply chain from production through distribution and retail to the examination of recycling ("end-of-life") automation. Two of our key research topics - Automated Identification (Auto-ID) and Intelligent Agents - are very hot topics right now, and we will provide updates on these technologies in the coming months.

We are very happy to announce that Rockwell Automation and Invensys have joined CDAC as founding members in 2004, as well as a strong group of Associate Members, all of whom are actively involving themselves in our activities. We look forward to seeing you at one of our events or to having you on board as a member.

Best regards,

Duncan McFarlane



*Dr. Duncan McFarlane,
Director of CDAC*

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Celebrity lecture



Professor Kenneth Preiss of Ben Gurion University visited the IfM and gave a lecture on agility to members and research students at the Institute. Professor Preiss together with Professors Goldman and Nagel produced the influential report for the US government in 1991 entitled *21st Century Manufacturing Enterprise Strategy: An Industry Led View*. This led to the establishment of the Agility Forum in the US and the best selling book *Agile Competitors and Virtual Organisations: Strategies for Enriching the Customer*(1995).

Professor Preiss examined the changes happening to manufacturing companies in today's turbulent business climate. Successful companies are those that have a dynamic rather than static capability when it comes to responding to external change. This capability he termed agility and he went on to outline how agility could be viewed in a series of levels.

He also explained his three axis model of the customer-supplier relationship which has proved useful in developing strategic planning to make organisations and their interfaces more dynamic.

A video of the lecture by Professor Preiss and a hardcopy of the associated overheads are available on loan to members of CDAC. For further details please contact: cdac-enquiries@eng.cam.ac.uk

Recycling on the move!



On March 4th, Morgan Johnson, Managing Director of MIREC Asset Management, a Europe-wide asset management firm, visited CDAC to discuss the feasibility of using RFID tags for returns management. He was accompanied by Paul Dumbleton, General Manager of SITA Recycling UK, MIREC's parent company. The EU Waste Electrical and Electronic Equipment (WEEE) Directive, which is due to become a UK law by August 2004 has led manufacturers and retailers to explore the use of next generation product identification technologies to manage their reverse logistics channels.

Steve Hodges, a senior research fellow from CDAC, gave an overview of Auto ID systems and the EPC Network. Alan Thorne, the CDAC laboratory manager, presented a demonstration highlighting the various aspects of using RFID tags on different types of products and associated issues. A key outcome of the visit was a desire that MIREC and CDAC explore the possibility of a field trial set up in coordination with major retailers of electrical and electronic equipment to see how RFID could bring improvements to the management of returned/end-of-life products.

Technology focus:

RFID or Radio Frequency Identification, is a key technology in a major revolution of the retail supply chain. Here we provide a brief introduction to the technology:

An RFID system consists of a tag (transponder) and a reader (interrogator). The technology deals with the remote collection of information stored on a tag using radio frequency communications. Information stored on the tag can range from as little as an identification number, through kilo-bytes of data, to dynamic information, such as temperature histories.

Critical factors in an RFID system include the range at which communication can be maintained, the size of the information space on the tag, the rate at which the communication can take place, the physical size of the tag, the ability of the system to communicate with multiple tags at the same time, and interference caused by something blocking the path between the reader and the tag. Several factors determine the level of performance that can be achieved. Other issues include the legal or regulatory emission levels allowed in the country of use, whether or not a battery is included in the tag to assist its communication back to the reader, and the frequency of the RF carrier used to transport the information between the tag and the reader.

Over decades of RFID development, industry has evolved various solutions that trade-off these constraints against each other. The vast majority of today's RFID systems employ only a few RF frequencies. These RF frequencies include relatively narrow bands centered at:

- 125/134KHz (LF)
- 13.56MHz (HF)
- 868/915/950 MHz (UHF)
- 2.45/5.8GHz (micro-wave)

Tags and reader combinations are described as employing LF, HF, UHF, or microwave technology. The typical relative performance of systems employing the various technologies is shown in the table below.

Freq'y	LF	HF	UHF	Micro-wave
Max Read Range (Passive Tags)	< 0.5 m	1 m	3 m	- 1 m
Data Rate	Slower	←→		Faster
Ability to read near metal or wet surfaces	Better	←→		Worse
Passive Tag Size	Larger	←→		Smaller

easyEPC™

The Cambridge Auto-ID Lab has recently started running Auto-ID training courses under the easyEPC™ label. EPC stands for Electronic Product Code, key to the automated identification system developed by the Auto-ID Centre. easyEPC™ is designed to help transfer the expertise gained by the Auto-ID Labs to industry as easily as possible. The courses seek to provide a good interface for companies with the lab experts who developed the EPC system, as well as providing industry with the knowledge they will require to understand, adopt and use the RFID and EPC technology.

The courses are now well underway; the Lab has carried out a number of both bespoke and open sessions for various companies. For more information please contact: autoid-enquiries@eng.cam.ac.uk

Case Study: Asset tracking with RFID



CDAC staff have recently carried out a consultancy assignment with a leading industrial gases supplier. The company asked the Institute for Manufacturing to provide help in determining their future strategy in tracking their prime assets – their cylinders. CDAC provided the technical expertise and advice on which technology was appropriate and the likely future trends in all of the RFID technologies.

Together with directors and senior managers the CDAC team with colleagues from the Centre for Technology Management helped create a technology road map. This tool allows the client company to explore the future potential technology landscape and create a strategic plan to navigate a route through it which will enable the company to achieve its objectives.

Feedback from the company was very positive and a broad understanding of the impact of the widespread adoption of RFID technologies and the possible implications for tracking gas cylinders was established. CDAC also carried out trials with selected RFID equipment to illustrate the effectiveness and limitations of the various technologies.

If you are interested in commissioning some consultancy work please contact:
cdac-enquiries@eng.cam.ac.uk

Wonderware course



Pictured on the right with James Brusey of CDAC, Stefan Cartharius, from the Wonderware division of Invensys gave a four day course (2 - 5 March) to CDAC staff and research students on the Wonderware Factory Suite of products, mainly looking at ArchestrA, but also touching on the Wonderware InTouch visualisation tool, Industrial SQL Server, and InControl, a software PLC.

During the course, we found out about how to use ArchestrA to manage a network of servers, workstations and PLCs and automatically deploy software and configuration changes across the network. An integrated development environment (IDE) is used to develop a model of the factory floor and includes a template based object modeling approach that allows for sub-structures, such as tanks or gate switches, to be reused. ArchestrA can be used in conjunction with InTouch to provide visualisation of the automated system at any node on the network. Also, alarms and history can be monitored. A scripting environment called QuickScript™ exists, which includes Microsoft's .NET extensions. This scripting can be used as a non-real time extension of the PLC control system.

As a test of the ArchestrA system, we developed a small system to control the conveyor gates for the MonTech conveyor in the CDAC Automation Laboratory.

Auto-ID Labs Manufacturing Special Interest Group

This group – which will be launched in the summer of 2004 - will focus on issues specific to the integration of RFID technology into manufacturing operations. In addition to the established base in consumer goods manufacturing, target sponsors for this group are manufacturers in automotive, consumer electronics, white goods and the aerospace sectors in conjunction with vendors of relevant software, hardware and solution services and systems integrators.

The aim of this group is to provide a forum for common research and development issues in RFID deployment in manufacturing.



Typical research activity areas are shown in the table below.

Theme	Example activity areas
Manufacturing Adoption Support	Manufacturing sectoral business cases Cross sectoral learning Standards
RFID Deployment in Manufacturing	Selecting hardware to match operational requirements and physical constraints Tagging in harsh conditions (metal, liquid, heat, etc) Meeting requirements for multiple applications
Manufacturing Systems Integration	Integration with Bar Code systems Integration with other sensors RFID and accurate location determination RFID Middleware requirements in manufacturing Integrating CAD data and production recipes
Manufacturing Applications	Managing Inbound raw materials supply RFID and Web Based, Distributed Operations Virtual tagging of Orders and Designs

Companies wishing to have a direct involvement with the labs research have an opportunity to sponsor this Special Interest Group (SIG). The SIG will establish a set of priority activities through a launch event and consultation with member organisations. Typically, priority activities will involve several member companies and will seek to resolve an issue and provide recommendations in a 6-12 month time frame. Output of the work will be a combination of white papers, presentations, specifications, demonstrations and simulations.

If you wish to be kept informed of developments with this SIG then please email:

autoid-enquiries@eng.cam.ac.uk

and we will register your contact details.

Major international companies join CDAC

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Two heavyweights in the international automation industry have joined CDAC as full members. Rockwell Automation, who own the Allen-Bradley PLC brand, and Invensys, whose portfolio of products include suites of shop-floor communication, automation and data acquisition software.

Rockwell Automation has strong interests in the development of intelligent real-time control strategies and the interpretation of Automatic Identification. Invensys, through its Wonderware brand, is a key player in the industrial middleware market and will team with CDAC in understanding the interface between its products and Auto-ID systems.

Events



CDAC is organising the annual traditional series of IfM evening workshops for local industry this year. The theme of the workshops is “New Perspectives in Product Management” and the focus is on taking the lessons gained from research and case studies out to industry as a whole.

The first workshop on responsiveness and agility, subtitled “They want it when?” was an enjoyable success with very active and vociferous participation from the delegates. The event was fully booked, as are the rest of the series. There are three more workshops in the series. The next is on Mass Customisation – “Sales said it would do what?” followed by Managing Complexity – “How did we get in this mess?” and Product Lifecycle Management – “But it’s yours now!”.

A longer one day event, Understanding Manufacturing under Stress will be run on the 8th June. Check out the web page for details on this and other future events at: <http://www.ifm.eng.cam.ac.uk/automation/>

Tailored events on these themes for specific company needs are available from CDAC. For more information please contact: cdac-enquiries@eng.cam.ac.uk

Industrial Visitors

Visitors to CDAC and the demonstration facilities in the period Jan-March 2004 include:

- SCA Packaging:** Main Board Director, Plant Manager
- Jaguar:** Chief Executive Officer, Chief Engineer
- BOC Edwards:** Chief Executive, Director of Technology
- Fanuc Robotics:** European President & CEO, Managing Director UK, UK Sales Manager
- ICI:** Research Associate, Plant Technical Manager Food Flavourings
- Quest International:** Operations Manager
- Rolls-Royce:** Director, Technical Manager
- GKN:** Director
- BT Exact:** Chief Executive Officer
- Heinz:** RFID Development Team

We have also welcomed a number of academic visitors including:

- Professor Peter Cole,** University of Adelaide
- Professor Chen-fu Chien,** National Tsing-hua University, Taiwan

Contact Us:

If you need any further details or have any enquiries please get in touch with us. Details below:

cdac-enquiries@eng.cam.ac.uk

Centre for Distributed Automation and Control
Institute for Manufacturing
Mill Lane
Cambridge
CB2 1RX
Tel: +44 (0)1223 764306
Fax: +44 (0)1223 765597