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## Australia drops on digital access index

Over the four years from 1998 to 2002, Australia has dropped eight places in the International Telecommunication Union's (ITU) Digital Access Index (DAI).

The index ranked 178 countries based on the overall ability of their citizens to access and use information and communication technology. The DAI combines eight variables, covering five areas, to provide an overall country score from 0 to 1. The areas are availability of infrastructure, affordability of access, educational level, quality of ICT services and internet usage.

Australia failed to make a showing in almost every category, including fixed line telephone subscribers per capita, mobile subscribers per capita and internet access prices as a percentage of per capita in-

come. However, it did come first in the education list, which compared literacy and school enrolments.

Overall, Australia recorded the second largest drop on the list, from 11th in 1998 to 19th in the 2002 DAI, scoring 0.74 along with Belgium. The only country to fall further was New Zealand, which dropped nine places, from 12th in 1998 to 21st in 2002.

Other big movers down the index were South Africa (from 30th to 36th), France (from 17th to 23rd) and the US (from fifth to 11th).

Scandinavian countries took four of the top five places, with Sweden being first with a score of 0.85, followed by Denmark with 0.83 and Iceland with 0.82. South

Korea also scored 0.82, which saw it improve 20 places from its ranking in the last DAI. Norway was fifth, while The Netherlands, Hong Kong, Finland, Taiwan and Canada rounded off the top 10.

The four Asian Tigers made the greatest progress over the last four years. Michael Minges of the Market, Economics and Finance Unit at ITU said these results suggest that English is no longer a decisive factor in quick technology adoption, especially as more content is made available in other languages.

"Over the last four years there's been a big shift in ICT leadership, it's moving towards Asia and away from the English-speaking nations," he said.

"Until now, limited infrastructure has often been regarded as the main barrier to bridging the digital divide. Our research, however, suggests that affordability and education are equally important factors."

Some of the poorest states in Africa and Asia come at the very bottom of the league table, hindered by lack of infrastructure or investment, poor education and literacy.

"In almost every country in that area one hour of internet use exceeds their per capita income," Minges said.

"But the problems they face are more than digital. They have problems with poverty, hunger and other things that need to be tackled beforehand."

The DAI forms part of the ITU's upcoming 2003 edition of the World Telecommunication Development Report (WTDR), published to coincide with the World Summit on the Information Society (WSIS).

Sources: International Telecommunication Union, Sydney Morning Herald, IDG News Service and Australian IT.

More Information – [www.itu.int](http://www.itu.int)

## Search for Australia's most influential engineers

Engineers Media is looking for Australia's 100 most influential engineers to help raise the profile of the engineering community and celebrate their contribution.

Monitor readers are invited to contribute by nominating an engineer or several engineers who they believe should be on the list. The nominated engineers must currently be in positions of influence in industry, academia, politics, defence and/or the community. The criteria of influence include leadership, management and entrepreneurial skills; promotion of professional ethics; focus on sustainability; technical bril-

liance; academic research achievements; support of young engineers through teaching and development programs; and involvement in community work.

Nominations can be sent to the managing editor of Engineers Media, Dr Dietrich Georg, at [dgeorg@engaustralia.com.au](mailto:dgeorg@engaustralia.com.au) along with an explanation of no more than 30 words as to why the nominated engineer should be included in the list. An advisory panel will assist in making the final selection. The list will be published in *Engineers Australia* magazine early next year.

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## Light work of quantum computers

Researchers from the universities of Queensland (UQ) and Illinois have made a breakthrough towards the development of quantum computers.

In a paper published in *Nature*, they described the successful building and testing a C-NOT gate, an essential component to enable quantum computers to work, using single photons.

Project team leader Dr Andrew White of UQ's School of Physical Sciences said interest in quantum computers has grown since it was recognised that they could, in principle, solve certain problems that are effectively impossible to do with conventional computers. Quantum computers could make many attempts to solve problems simultaneously by exploiting properties of quantum information, thus speeding up the process.

"The critical component necessary for a quantum computer to work is a Controlled-NOT (C-NOT) gate – a gate that lets one qubit (quantum bit) control the state of another," White said.

"If one qubit is simultaneously on and off, then both bits can become entangled – that is, correlated in apparently impossible ways. It is entanglement that makes

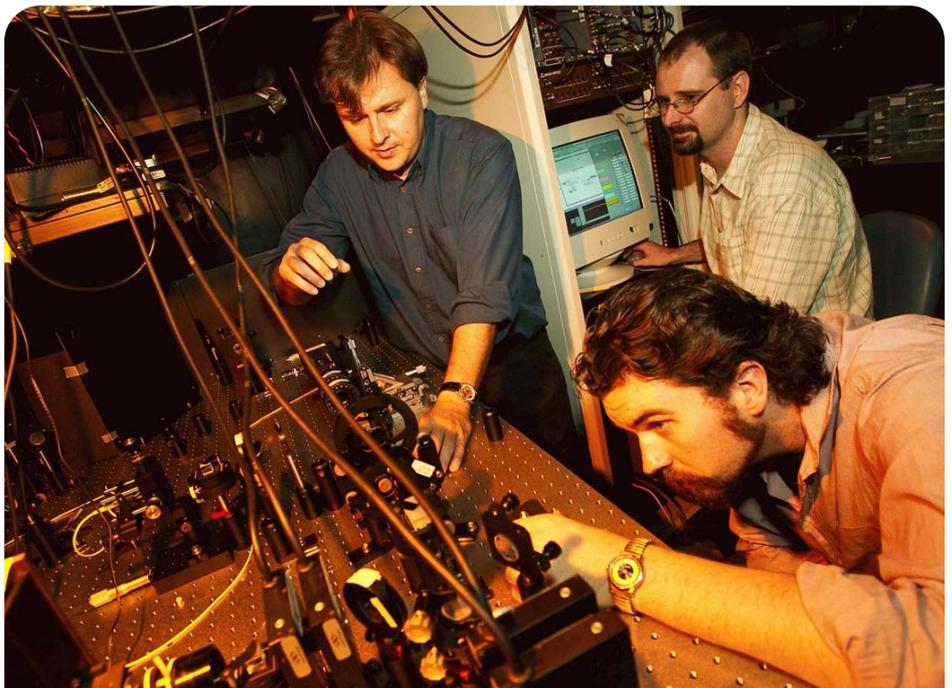
quantum computing so powerful."

At the invitation-only annual review of quantum computing by the US Army Research Office, White presented results from the C-NOT gate made using single photons. Using an automated tomography system developed in UQ's Quantum Technology Lab, he demonstrated that the gate reliably makes one qubit control another and, if one qubit is simultaneously on and off, the gate produces highly entangled qubits.

The research team, consisting of White, Dr Jeremy O'Brien, Dr Geoff Pryde, Assoc Prof Timothy Ralph (UQ) and Dr David Branning (University of Illinois), next plans to study gate errors. In a normal logic gate this is simple, as there are a small number of possible input states. It is more difficult in a quantum logic gate, as an infinite number of input states exist.

The UQ members are part of the Australian Research Council Centre of Excellence in Quantum Computing Technology. Their work has received US Army Research Office funding of US\$750,000 for a three-year program.

More Information – [www.quantinfo.org](http://www.quantinfo.org)



University of Queensland researchers Dr Andrew White (left), Dr Geoffrey Pryde (back) and Dr Jeremy O'Brien (front) were part of the team that developed the first optical C-NOT gate.

PHOTO: CHRIS STACEY, THE UNIVERSITY OF QUEENSLAND

## Another 53 jobs lost

Motorola has announced it will close its research and development laboratory in Sydney at a cost of 53 software engineering jobs, *The Australian* has reported.

The decision ends the company's long-range R&D presence in Australia and comes just six months after it closed its Sydney software centre, cutting 58 positions.

Motorola maintains a local presence in short-term R&D, employing 400 staff at its Adelaide software centre, and is building up its 3G centre in Perth, having announced a five-year, \$35 million commitment earlier this year.

Motorola Pacific division president John Ghergetta said the decision to close the Sydney facility was part of a global restructuring of R&D.

"This time of year we have our corporate labs come up with a new strategy based on centres of excellence, looking around the world to find critical mass in seven technology sectors," he said.

"Sydney was a fantastic lab but what worked against it was working in five to

six areas. You couldn't honestly call it a centre of excellence where you get critical mass."

The centre's 53 staff will be eligible for redeployment locally and internationally. About 30% of staff from the earlier round of layoffs at the Sydney software centre were redeployed.

In an unrelated decision, Motorola's Adelaide centre will be boosted by moves to locate a major chip design capability there. Working for Motorola's semiconductor products sector, the facility will work on embedded applications, an area tipped for rapid growth.

Ghergetta said recruitment at the design centre has already begun and will continue over several years.

"Despite difficulties created by the changing marketplace and global strategies, Motorola remains committed to Australia and remains a major private investor in R&D through its software development and IC design activities," he said.

☞ *More Information* – [www.motorola.com/au](http://www.motorola.com/au)

## UTS joins global ICT program

The University of Technology Sydney has become the only Asia-Pacific university to join a research partnership program with communications company Alcatel, *Australian IT* has reported.

The program allows Alcatel's research units to explore future product possibilities by working with universities from around the world. 11 overseas universities are already involved.

UTS and Alcatel have been working together since 1999 on various information technology and engineering projects. Alcatel is looking at the commercialisation of UTS research on network management solutions.

Although details of the long-term collaboration are yet to be finalised, some of the new projects will involve working out how some of Alcatel's global products will suit the Australian market. There will also be an opportunity for teacher and student exchanges with research and innovation centres overseas.

☞ *More Information* – [www.uts.edu.au](http://www.uts.edu.au)

## news in brief

■ ■ CSIRO has developed new scanning technology that can produce 3D digital images of small objects. The image, which provides extra information about the object's surface shape and texture, does not require special glasses or other equipment to view.

Anna McDonald, a commercial analyst at CSIRO, said the technology could be easily incorporated into designs of new mass market flatbed scanners, fax machines or photocopiers, making 3D scanning accessible to the home and office user.

■ ■ Research engineer Masaaki Fukumoto of Japanese telecommunications company NTT DoCoMo has invented the world's first wristwatch phone that works by transforming the user's finger into an earpiece, *New Scientist* has reported.

The prototype Finger Whisper consists of a wristband that converts digital signals into vibrations that are transmitted into the bones of the hand. The

user puts their finger into their ear for the vibrations to be picked up by the eardrum, which then transcribes them back into sound signals for the brain. To respond, the user simply speaks into a microphone on the wristband.

By touching forefinger to thumb, the user starts or ends a call, and the device uses voice recognition technology to dial the number. There is no keypad.

■ ■ The third round of the Queensland government's \$150 million Smart State Research Facilities Fund is now open for new applications. Innovation minister Paul Lucas said the program has so far provided funds to research institutions across the state like the Australian Institute for Bioengineering and Nanotechnology, and the Queensland Microtechnology Facility in Brisbane.

Applications for funding are open until 30 January 2004. For more information, visit the Department of Innovation and Information Economy's website at [www.iie.qld.gov.au](http://www.iie.qld.gov.au).

■ ■ The University of South Australia has won the Electronics Industry Association's Gold Cup for excellence in taking its turbo coding technology for satellite modems through innovative product development and manufacturing processes to successful commercialisation in national and global markets.

The university's spin-off company Iterative Connections teamed with Silicon Valley-based Ultimate Datum to develop and market the Premier 5 modem, which uses turbo coding technology developed by Dr Adrian Barbulescu from UniSA's Institute for Telecommunications Research.

■ ■ Epson has developed what it claims is the world's smallest flying prototype microrobot. The mFR (Micro Flying Robot) is 130mm in diameter, 70mm tall and weighs less than 9g. It causes levitation by use of contra-rotating propellers powered by an ultrathin, ultrasonic motor. ●

## “Playable” nanoguitar shows electronics potential

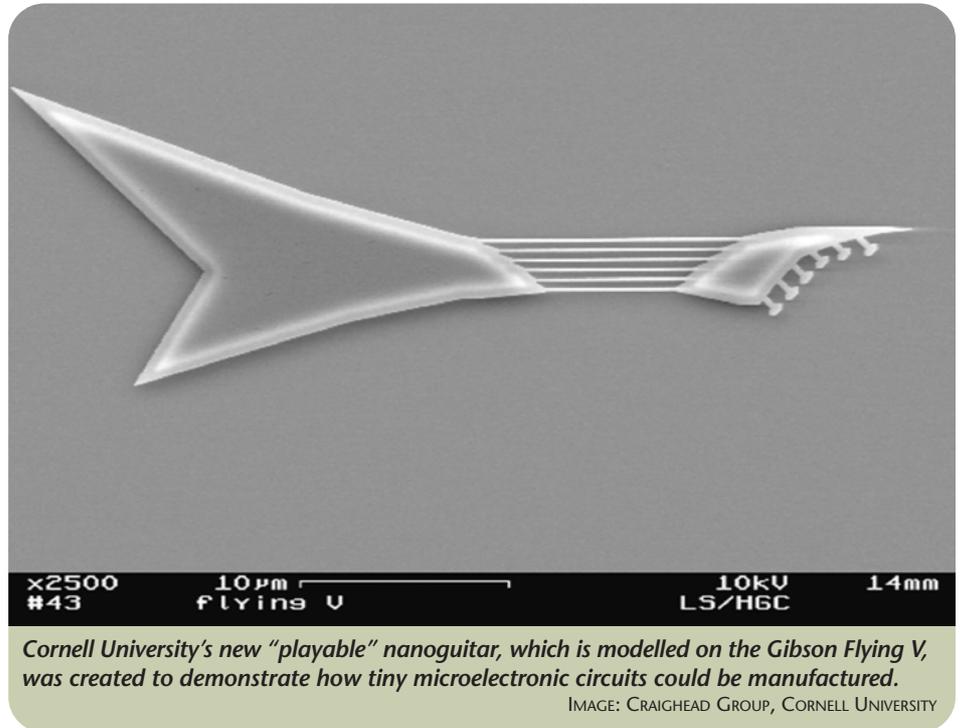
Six years ago Cornell University researchers built the world’s smallest guitar – about the size of a red blood cell – to demonstrate the possibility of manufacturing tiny mechanical devices using techniques originally designed for building microelectronic circuits.

Now, by “playing” a new, streamlined nanoguitar, Cornell physicists have demonstrated how such devices could substitute for electronic circuit components to make circuits smaller, cheaper and more energy-efficient.

Lidija Sekaric built the new, playable nanoguitar, which is five times larger than the original, while an applied physics graduate student at Cornell with graduate student Keith Aubin and undergraduate researcher Jingqing Huang.

Its strings are made from silicon bars 150nm x 200nm in cross-section and ranging from 6mm-12mm in length. The strings vibrate at frequencies 130,000 times higher than those of a real guitar.

The nanoguitar is played by hitting the strings with a focused laser beam. When the strings vibrate they create interference patterns in the light reflected back, which can be detected and electronically converted to audible notes. The device can play only simple tones, although chords can be played by activating more than one string at a time. The pitches of the strings are determined by their length, not by their tension as in a



Cornell University's new “playable” nanoguitar, which is modelled on the Gibson Flying V, was created to demonstrate how tiny microelectronic circuits could be manufactured.

IMAGE: CRAIGHEAD GROUP, CORNELL UNIVERSITY

normal guitar, but the group has “tuned” the resonances in similar devices by applying a DC voltage.

Sekaric said the ability to make tiny things vibrate at very high frequencies offers many potential applications in electronics.

“If nanoscale objects can be made to vibrate at radio frequencies, they can substitute for other components in electronic

circuits,” he said.

“Mobile phones and other wireless devices, for example, usually use the oscillations of a quartz crystal to generate the carrier wave on which they transmit or to tune in an incoming signal. A tiny vibrating nanorod might do the same job in vastly less space, while drawing only milliwatts of power.”

More Information – [www.cornell.edu](http://www.cornell.edu)

## Moore’s Law still prevails

Intel has achieved an average feature size of just 65nm for its next generation computer chip, half the size of the most advanced manufacturing technology in use today.

If the chip is manufactured by 2005 as planned, it will ensure that the number of transistors engineers can fit into a given area will continue to double every two years – keeping Moore’s Law, named after Intel cofounder Gordon Moore, alive.

The new chip is a static random access memory (SRAM) cell, a faster and more reliable alternative to dynamic RAM. SRAM cells made by a 90nm process first used in manufacturing this year are 1mm<sup>2</sup>

in size. In contrast, the new 65nm process produces cells that are only 0.57mm<sup>2</sup>.

The SRAM chip relies on technologies Intel has used to preserve Moore’s Law before. This includes strained silicon, introduced for the 90nm chip, and copper interconnects, introduced for the 130nm chip in 2001.

Strained silicon is a manufacturing technique in which a layer of silicon germanium is deposited on top of a silicon wafer. The atoms in each substance naturally seek to align themselves, which stretches the silicon, allowing more electrons to flow than was possible with just silicon.

Mark Bohr, an Intel senior fellow and director of the company’s process architecture and integration, said eight layers of copper interconnects and a new low-k dielectric material will be used on the 65nm chips to reduce power consumption. A material’s “k” value refers to its ability to compress electrical fields, and a dielectric with a lower k value increases the speed at which electrons flow through a transistor.

70% of the equipment Intel uses to produce its 90nm technology will be reused for the new chips to avoid price hikes.

Sources: New Scientist and IDG News Service.

More Information – [www.intel.com](http://www.intel.com)

## Shrinking circuits

Researchers at Harvard University in the US have demonstrated a technique to apply a film of high-performance silicon nanowires to glass and plastic, which could pave the way for cheaper, lighter and more powerful consumer electronics.

Dr Charles Lieber, head of the research project and a professor of chemistry at Harvard, said the silicon nanowires are better at carrying an electrical charge than amorphous silicon and polycrystalline silicon, which are used for making electronic components such as computer chips and LCDs.

“Although a single nanowire is one thousand times smaller than the width of a human hair, it can carry information up to 100 times faster than similar components used in current consumer electronic products,” he said.

Lieber said the wires have already been shown to have the ability to serve as components of highly efficient computer chips and can emit light for brilliant multicolour optical displays, but until now it has been difficult to apply them to consumer products.

“As with conventional semiconducting materials, the growth of high-quality nanowires requires relatively high temperature. This temperature requirement has up until now limited the quality of electronics on plastics, which melt at such growth

temperatures,” he said.

“By using a bottom-up approach pioneered by our group, which involves assembly of preformed nanoscale building blocks into functional devices, we can apply a film of nanowires to glass or plastics long after growth, and do so at room temperature.”

Using a liquid solution of the silicon nanowires, the researchers demonstrated they can deposit the silicon onto glass or plastic surfaces – similar to applying the ink of a laser printer to a piece of paper – to make functional nanowire devices. They also showed that nanowires applied to plastic can be bent or deformed into various shapes without hurting performance.

☞ *More Information – [www.harvard.edu](http://www.harvard.edu)*

## DNA transistor

Researchers at the Technion-Israel Institute of Technology have used DNA to create a self-assembling nanoscale transistor.

Erez Braun, project head and associate professor in the Faculty of Physics at the Technion, said to get the transistors to self-assemble, the research team attached a carbon nanotube onto a specific site on a DNA strand and then made metal nanowires out of DNA molecules at each end of the nanotube. The result is a transistor that can be switched on and off by applying voltage to it.

“Though transistors made from carbon nanotubes have already been built, those required labour-intensive fabrication,” he said. “The goal is to have these nanocircuits self-assemble, enabling large-scale manufacturing of nanoscale electronics.

“DNA is a natural place to look for a tool to create these circuits. But while DNA by itself is a very good self-assembling building block, it doesn’t conduct electrical current.”

To overcome these challenges, the researchers manipulated strands of DNA and added an E. coli bacterium protein to one segment. They then added other protein molecules to the test tube, along with protein-coated carbon nanotubes. These proteins naturally bond together, causing the carbon nanotube to bind to the DNA strand at the bacteria protein.

Finally, they created tiny metal nanowires by coating DNA molecules with gold. In this step, the bacteria protein also prevented the metal from coating the bacteria-coated DNA segment, creating extending gold nanowires only at the ends of the DNA strand.

Braun said the next challenge is to encourage the nanotube to line up parallel to the DNA strand, meet the nanowires at either end and thus make a circuit.

The research is published in the 21 November 2003 issue of *Science*.

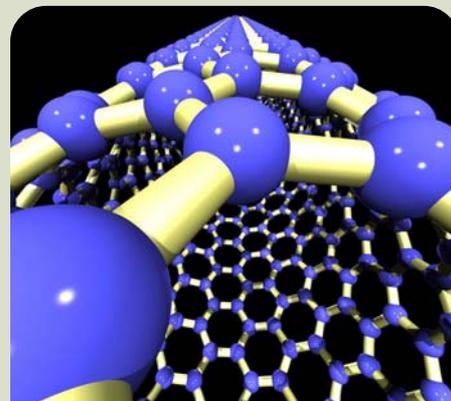
☞ *More Information – [www.technion.ac.il/english](http://www.technion.ac.il/english)*

## Call to join global nanotechnology network

International R&D network IMS (Intelligent Manufacturing Systems) is inviting Australian companies, institutions and individuals to express their interest in collaborating in a global effort to develop manufacturing processes in nanotechnology.

It is proposing to establish a Community of Common Interest (CCI), called n-ABLE, with manufacturers, users, product developers, investors, researchers, academics and others with an interest in participating and collaborating in a long-term relationship that will drive innovation in manufacturing for the nanotechnology industry.

“The intention of the CCI is to enable and facilitate synergies among its members while creating new IMS



*A computer model of a carbon nanotube, which researchers are attempting to use as molecular wires in the manufacture of low voltage field electron emitters.*

IMAGE: CHRIS EWELS

projects and programs to address the priority needs of the nanotechno-

logy-manufacturing sector,” Tony Strasser, manager of the IMS Australia Secretariat, said.

“Additional priorities include addressing the need for education and training in the new production methods, tools, and analytical and testing techniques required for nanotechnology manufacturing.

“They also involve understanding the possible toxic and other hazardous properties of various nanomaterials and the possible effects those materials, along with processing at the nanometre scale, may have on other living matter.”

Those interested in participating in the CCI can contact IMS Australia on phone 02 9928 2366 or email [IMSAustralia@au.ims.org](mailto:IMSAustralia@au.ims.org).

☞ *More Information – [www.au.ims.org](http://www.au.ims.org)*

ITEESPAN (Information, Telecommunications and Electronics Engineering Student Presentation and Awards Night) is a ITEES Canberra Chapter activity where final year students from the Australian National University, the University of Canberra and the Australian Defence Force Academy at the University of NSW present details of their thesis. The winner of this year's best paper and presentation was Sean King from the University of Canberra. The following is a summary of his and the other finalists' presentations.

## Watermarking and the protection of digital media

by Sean King, University of Canberra

The University of Canberra ITEESPAN presentation focused on watermarking still images in the frequency domain. The speech included an overview of general watermarking techniques; the effects of embedding data in the frequency domain; the processes involved in imperceptible insertion; and an insight into Image Guard, a watermarking package developed by engineering students at the university.

Digital media can be easily copied without degradation in quality. The simplicity of perfect replication has led to

large-scale problems in protecting copyright of digital media.

The necessity for protection of still images, video and audio is continually increasing. The International Intellectual Property Alliance estimated the US economy alone lost more than \$9 billion due to copyright breaches in the 2000/01 financial year.

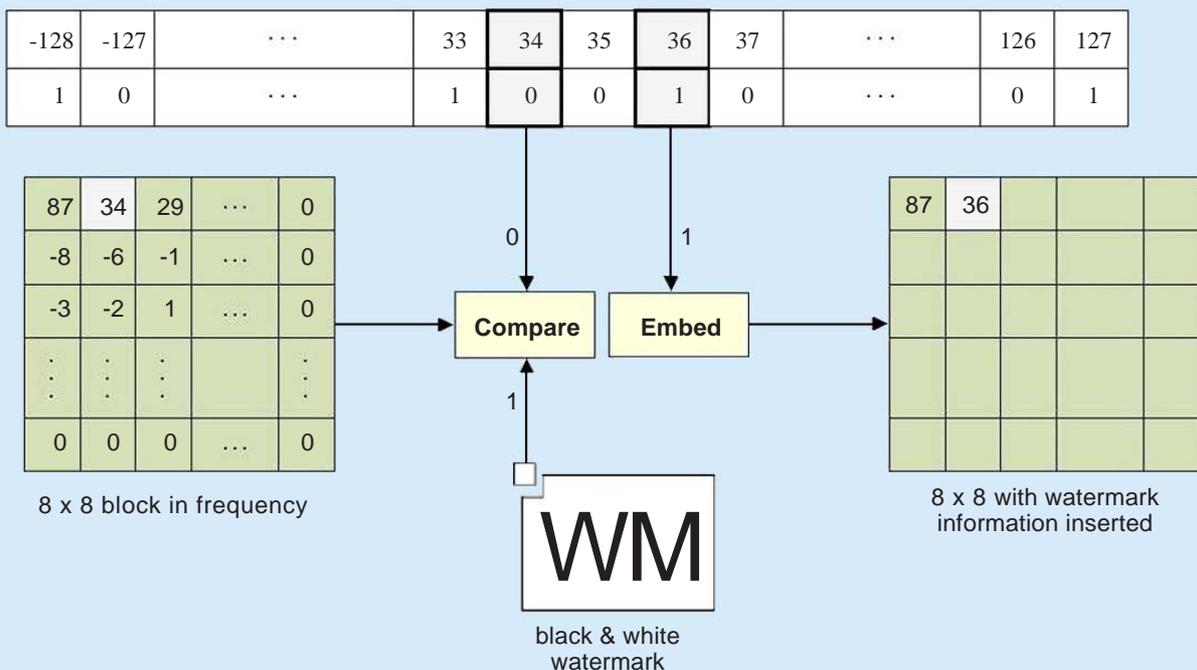
Digital watermarking is emerging as a primary security solution for the prevention of unauthorised duplication, modification and misuse of digital media.

Watermarking involves imperceptibly embedding an identification signal, called a watermark, into a specified host signal. The modification of the host signal is undetectable to humans, however a designated detector can easily extract the watermark. Digital watermarking has a number of applications including copyright protection, authentication, broadcast and publication monitoring, and tamper inspection.

The major characteristics considered when selecting a watermarking technique are robustness, perceptibility and fidelity. Other issues include the computational costs and false positive rates of the technique. After researching the various techniques it was decided that the frequency domain displayed the most desirable characteristics.

Image Guard is a watermarking package developed by final-year computer engineering students Brad Willis, Ben Bordiss and myself. The package is based on the look-up table technique that was proposed by Min Wu and Bede Liu of Princeton University in their paper "Wa-

Look-up table: each user's table has the same top row, however the pattern of 0s and 1s on the bottom row will be different depending on the user.



The first bit of the watermark is inserted into an 8 x 8 block of the image. Here a white bit (1) of the watermark is inserted by changing the DCT coefficient 34 to 36 according to the entries in the look-up table.

An example of embedding a watermark using the look-up table method.

termarking for image authentication”.

The program imperceptibly embeds a visually meaningful watermark in the frequency domain. The technique is semifragile, allowing Image Guard to be used for ownership authentication and tamper inspection. The program goes beyond the greyscale method proposed by Wu and Liu and allows users to process colour images.

The technique works by breaking the original image into blocks of 8 x 8 pixels. Each block is then converted into the frequency domain using the Discrete Cosine Transform (DCT), resulting in an 8 x 8 block of numerical coefficients. The coefficients range from -128 to 127, and are known as the DCT coefficients of the 8 x 8 block.

One bit of a black and white watermark is inserted in each block of the image. If the first bit of a watermark is white (1) then every embeddable DCT coefficient in the first image block will be mapped to the nearest coefficient in the look-up table with an entry of 1.

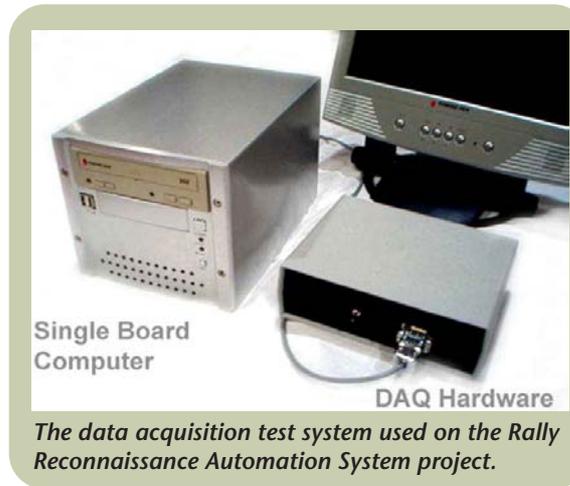
*Sean King is undertaking the double degree Bachelor of Computer Engineering / Bachelor of Law at the University of Canberra. Readers interested in learning more about digital watermarking or the Image Guard package can contact him or another member of the project team at the University of Canberra's Information Sciences and Engineering Department.*

## Rally reconnaissance automation system

*by Joshua Thow, Australian National University*

The dynamic environment in which rally vehicles operate poses an interesting problem for data-acquisition and processing. The Rally Reconnaissance Automation System is a navigation tool that interprets vehicle trajectory information into the language used by the crew of the rally vehicle.

As the driver controls the vehicle through a set course of a rally competition, the codriver reads aloud a description of the road ahead. The pace-note instructions allow the driver to prepare for corners, jumps, hazards and other road conditions. The pace-notes are compiled during preevent reconnaissance, where



Single Board Computer

DAQ Hardware

*The data acquisition test system used on the Rally Reconnaissance Automation System project.*

the course is driven slowly to allow the crew to assess the conditions and write them down in a short-hand script.

The Rally Reconnaissance Automation System aims to minimise the human estimation involved in reconnaissance, hence improving the accuracy of the pace-notes and efficiency of the process.

Many factors are considered by the crew when writing an instruction, and each of these must be measured by the system to accurately replicate the pace-note output. While a simple analysis of vehicle attitude and inertia provides much of the information needed, other factors such as wheel slip and driving style must also be considered.

The design uses existing and introduced sensors to acquire dynamic vehicle data. The acquired data is analysed by software executed on a single board computer, which displays the generated pace-notes to the codriver through an LCD.

A prototype acquisition system was implemented during the project, which focused on processing the most frequently used pace-notes that described corners and distances inside the course. A gyroscope provided vehicle heading information, while wheel speed sensors provided velocity and position of the vehicle. The sensors were sampled by a PIC microprocessor that was integrated onboard with signal conditioning circuitry. The PIC software transmitted the sensor data to the single board computer for processing, through a serial communications interface.

While the development of the processing software and graphical user interface continues, the data-acquisition system has been implemented with an aim towards production. The system success-

fully performed in acquiring fundamental vehicle data. The challenge to expand the abilities of the system to detect more subtle road conditions (such as when a crest will be driven fast enough to become a jump) will continue as development progresses.

*Development for the Rally Reconnaissance Automation System was initiated by Joshua Thow of the Australian National University for the final year Systems Engineering Honors project. The project was conducted*

*in conjunction with a local engineering business, Qirx Pty Ltd.*

## Development of a single photon detector

*by Trevor Wheatley, Australian Defence Force Academy at the University of NSW*

Single photon detectors (SPDs) are at the heart of a number of very important and topical research areas such as optical quantum computing and quantum key distribution – technologies that can only be made possible by the ability to detect a single photon. Research in these areas within the School of Information Technology and Electrical Engineering at the Australian Defence Force Academy has driven the need to be able to construct these devices.

The detection of single photons is a very difficult yet interesting task due to the high voltage, very fast response times and the need for cooling. This project covered the entire development of a basic SPD for use at a communications wavelength, including the design, development and testing of the circuits that provide these properties and the physical design of the mounting. The project also used a novel way to obtain, store and analyse the test data obtained during the characterisation of the avalanche photodiode used in the detector.

The difficult task of putting a single photon on to the active area of the avalanche photodiode, and obtaining and analysing the necessary data to show that this photon can be detected, was also addressed. ●

## Marconi's Miracle: The Wireless Bridging of the Atlantic

by Donald Tarrant

Hardback 109 pages with black and white illustrations  
 Flanker Press Ltd St John's, Newfoundland, Canada 2001 ISBN 1-894463-13-7  
 Available from [www.tidespoint.com](http://www.tidespoint.com)

Review by David Edwards

This book is a detailed account of Guglielmo Marconi's epic feat of communication by radio across the Atlantic Ocean from Poldhu in Cornwall to St John's, Newfoundland. It was a gift recently sent to me by my friend Len Zedel in St John's.

The introduction to this book provides a brief overview of the part Newfoundland has played in reducing the apparent size of the world. The first transatlantic telegraph cables terminated there; it was the departure point for Alcock and Brown's pioneering non-stop transatlantic flight; and the first transatlantic telephone cable also terminated in Newfoundland. This book, however, is about the first transatlantic radio telegraphy signal.

The first chapter gives a summary of early communications technology and the role played by pioneers such as Oersted, Faraday, Wheatstone, Cooke, Morse, Maxwell, Hertz and Lodge. In 1888, Heinrich Hertz proved that James Clerk Maxwell's theoretical electromagnetic waves actually existed by transmitting and receiving a radio signal through the air in his laboratory.

Chapter 2 provides brief details of Marconi's family (his mother was from an Anglo Irish whisky family, his father was an Italian businessman) and his early experiments at Villa Griffoni at Pontecchio in Italy. It was here in 1895 that Marconi succeeded in receiving radio signals from his transmitter at distances of more than one mile (1.6km). Due to the location of his workshop and the topography of Villa Griffone, the longer distances were not line of sight. A small hill rises behind the villa and the young Marconi succeeded in receiving signals beyond its brow.

Chapter 3 details how in 1896, after receiving a rebuff from the Italian Department of Posts and Telegraph, 23-year-old Marconi journeyed to England, where his mother's family contacts gave him valuable assistance in patenting his invention

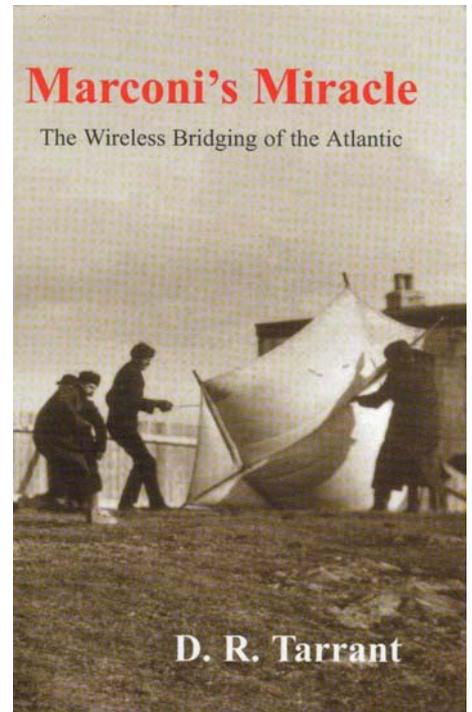
and then demonstrating it to William Preece, the engineer-in-chief at the British Post Office. Marconi continued to refine his system and by 1899 had succeeded in sending wireless telegraphy signals across the English Channel. He had also developed the theory of tuning, which allowed many simultaneous signals to be transmitted and received at once, without interference. This became the famous "four sevens" patent of 1900.

In September 1899 Marconi travelled to America and gained excellent publicity by using his wireless telegraphy system to report on the October 1899 America's Cup yacht race between the USA's Columbia and the English Shamrock II. What made Marconi's system such a breakthrough was that he transmitted live reports from two ships that accompanied the racing yachts.

The conclusion of Chapter 4 covers his early attempts (and failures) at transatlantic wireless communications, using very large transmitters and giant aerial systems. Unfortunately, in late September 1901, the antenna systems at both Poldhu in Cornwall and Cape Cod in Massachusetts were destroyed by storms. But Marconi persevered, rebuilding the Poldhu antenna to a different design and deciding to relocate to St John's, Newfoundland, over 1000 miles closer to Cornwall.

Chapter 5 provides a brief overview of early communications in Newfoundland, with details of land and sea based telegraphic systems, as well as land based telephones.

Marconi and his assistants Kemp and Paget arrived in St John's on 6 December 1901, and soon set up their receiver and aerial systems on Signal Hill. The balloons were no match for the blustery winds, but the kites fared better. However, their height varied with the gusts and this caused unwanted signal intensity variations, forcing Marconi to use a less sophisticated re-



ceiver. Marconi persevered and was rewarded at 12.30pm on 12 December 1901 when both he and Kemp heard the Morse signal "dot dot dot" for S, which they knew had originated at Poldhu.

Marconi's faith in wireless had been vindicated, but problems lay ahead. The Anglo-American Telegraph Company had a government authorised monopoly on all telegraphic communications with Newfoundland, and this included wireless telegraphy. Marconi was forced to abandon plans to set up a permanent station in Newfoundland and moved instead to Nova Scotia.

The book concludes with a brief epilogue, which details his ultimate success in establishing a full duplex wireless telegraphic service across the Atlantic Ocean and recounts in brief how Marconi was awarded the Nobel Prize for physics in 1909.

Overall, this book, with its emphasis on local events and occurrences in Newfoundland, would be a worthy addition to the library of anyone interested in the early history of telecommunications. Author Donald Tarrant is a professional engineer with over 30 years experience in the communications industry who lives in St John's. He is also the author of "Atlantic Sentinel: Newfoundland's Role in Transatlantic Cable Communications". ●

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## Computing

**Conferences:** **AMF: Fifth international conference on advances in fluid mechanics** Lisbon, Portugal 22 March (3 days); **Heat transfer** Lisbon, Portugal 24 March (3 days); **BEM 26: 26th world conference on boundary and mesh reduction methods** Bolonga, Italy 19 April (3 days); **Computational finance** Bolonga, Italy 21 April; **Oil spill : Fourth international conference on oil & hydrocarbon spills, modelling, analysis & control** Alicante, Spain 28 April (3 days); **New learning : International conference on new learning paradigms and new learning tools** Skiathos, Greece 10 May (3 days); **Data security** Skiathos, Greece 11 May (3 days). *Inquiries:* Wessex Institute of Technology +440 238029 3223, fax +440 238029 2853, email enquiries@wessex.ac.uk, web www.wessex.ac.uk

**Symposium:** **3rd virtual machine research and technology symposium** San Jose, US 6 May (2 days). *Inquiries:* Tarek Abdelrahman, University of Toronto email vm04chair@usernix.org, web www.usernix.org/events/vm04/index.html

**Conference:** **26th international conference on software engineering** Edinburgh, UK 23 May (6 days). *Inquiries:* Anthony Finkelstein email a.finkelstein@cs.ucl.ac.uk, web conferences.iee.org/ICSE

**Workshop:** **Third annual workshop on duplicating, deconstructing and debunking** Munich, Germany 19 June (2 days). *Inquiries:* Bryan Black, Intel Labs email bryan.black@intel.com, web www.ece.wisc.edu/~wddd//index.shtml

**Conference:** **17th international conference on parallel and distributed computing systems** San Francisco, US 15 Sept (3 days). *Inquiries:* Waleed S. Smari, University of Dayton, USA +505 277-6724, email dbader@ece.unm.edu, web multimedia.ece.uic.edu/pdcs

**Conference:** **8th international conference on parallel problem solving from nature** Birmingham, UK 18 Sept (5 days). *Inquiries:* Xin Yao, University of Birmingham +44 12 141 42215, fax +44 12 141 44281, email ppsn04@cs.bham.ac.uk, web events.cs.bham.ac.uk/pps04

**Symposium:** **Symposium on hardware/software codesign** Rio de Janeiro, Brazil 12 Oct (4 days). *Inquir-*

*ies:* World Scientific and Engineering Academy and Society (WSEAS) email peri@wseas.org, web www.worldses.org/conferences/brazil/iscoco  
**Symposium:** **12th international symposium on the foundations of software engineering** Newport Beach, US 31 Oct (7 days). *Inquiries:* Richard N. Taylor, Information and Computer Science, University of California +949 824 6429, fax +949 824 1715, email taylor@uci.edu, web www.isr.uci.edu/FSE-12

## Control

**Conference:** **5th Asian control conference** Melbourne 20 July (4 days). *Inquiries:* email ascc@ee.mu.oz.au, web ascc.ee.mu.oz.au

**Symposium:** **IFAC symposium on mechatronic systems** Sydney 6 Sept (3 days). *Inquiries:* email mechatronics@ee.newcastle.edu.au, web mechatronics.newcastle.edu.au/mech

**Conference:** **Asia and South Pacific design automation conference** Yokohama, Japan 27 Jan (4 days). *Inquiries:* Conference secretariat, Japan Electronics Show Association +81 3 5402 7601, fax +81 3 5402 7605, email aspdac@jesa.or.jp, web www.aspdac.com

**Symposium:** **Advances in automotive control** Salerno, Italy 19 April (5 days). *Inquiries:* International Federation of Automatic Control email ifac04@unisa.it, web www.ifac04.unisa.it

**Conference:** **The IEEE international conference on robotics and automation** New Orleans, US 26 April (7 days). *Inquiries:* web www.egr.msu.edu/ralab/icra

**Symposium:** **2nd IFAC symposium on telematics applications in automation and robotics** Helsinki, Finland 21 June (3 days). *Inquiries:* Finnish Society of Automation +358 201 981220, fax +358 201 981227, email office@atu.fi, web www.automaatioseura.fi/index.php

**Conference:** **World automation congress** Seville, Spain 28 June. *Inquiries:* WAC secretariat +1 505 298 5817, fax +1 505 291 0013, email wac@cybermesa.com, web www.wacong.com/Wac

**Conference:** **American control conference** Boston, US 30 June (3 days). *Inquiries:* Jason Speyer, UCLA +1 310 206 4451, fax +1 310 206 2302, email speyer@seas.ucla.edu, web www.

mie.uiuc.edu/acc/index.asp

**Symposium:** **Intelligent autonomous vehicles** Lisbon, Portugal 5 July (3 days). *Inquiries:* International Federation of Automatic Control email iav04@isr.ist.utl.pt, web iav04.isr.ist.utl.pt

**Conference:** **Control applications in marine systems** Ancona, Italy 7 July (3 days). *Inquiries:* International Federation of Automatic Control email cams04@unian.it, web www.automazione.ee.unian.it/cams04

**Symposium:** **IFAC symposium on large scale systems: Theory and applications** Osaka, Japan 26 July (3 days). *Inquiries:* International Federation of Automatic Control email ikeda@mech.eng.osaka-u.ac.jp

**Workshop:** **IFAC workshop on periodic control systems** Yokohama, Japan 30 Aug (3 days). *Inquiries:* email sano@sd.keio.ac.jp, web www.contr.sd.keio.ac.jp/ifacws04/main.htm

**Symposium:** **6th IFAC symposium on nonlinear control systems** Stuttgart, Germany 1 Sept (3 days). *Inquiries:* International Federation of Automatic Control email nolcos@ist.uni-stuttgart.de, web www.nolcos.uni-stuttgart.de

**Conference:** **Advanced control strategies for social and economic systems** Vienna, Austria 2 Sept (3 days). *Inquiries:* International Federation of Automatic Control email kopacek@ihrt.tuwien.ac.at, web www.ihrt.tuwien.ac.at/acs04

**Workshop:** **2nd IFAC workshop on advanced fuzzy and neural control** Oulu, Finland 16 Sept (2 days). *Inquiries:* International Federation of Automatic Control email office@atu.fi, web www.ntsat.oulu.fi

**Workshop:** **Discrete event systems** Reims, France 22 Sept (3 days). *Inquiries:* International Federation of Automatic Control email wodes04@univ-reims.fr, web www.univ-reims.fr/wodes04

## Electronics

**Conference & Exhibition:** **electronicaUSA and embedded systems conference** San Francisco, US 29 March (5 days). *Inquiries:* German-Australian Chamber of Industry and Commerce 03 9867 1198, fax 03 9867 1199, email gccmel@germany.org.au, web www.electronicaUSA.com

**Conference:** **24th international conference on microelectronics** Nis, Serbia and Montenegro 16 May (4 days). *Inquiries:* Ninoslav Stojadinovic, University of Nis +381 18 529326, fax +381 18 46180, email miel@elfak.ni.ac.yu, web unitop.elfak.ni.ac.yu/miel

**Conference:** **11th international power electronics and motion control conference** Riga, Latvia 2 Sept (3 days). *Inquiries:* Riga Technical University +371 708 9415, fax +371 782 0094, email Epe-pemc@adm.rtu.lv, web www.rtu.lv/epe-pemc

**Conference:** **European powder diffraction conference** Prague, Czech Republic 2 Sept (4 days). *Inquiries:* Radomir Kuzel, Czech and Slovak Crystallographic Association +042-2-21911394, fax +042-2-24911061, email kuzel@karlov.mff.cuni.cz, web www.xray.cz/epdc

## Information Technology

**Conference:** **Annual Australian Linux technical conference** Adelaide 12 Jan (6 days). *Inquiries:* Linux Australia web conf.linux.org.au

**Course:** **Information security management essentials** Melbourne 17 Feb, Sydney 18 Feb, Perth 16 March. *Inquiries:* Alastair Sharman, EWA email alastair.sharman@ewa-australia.com, web www.ewa-australia.com/training/isme

**Conference:** **Australian software engineering conference** Melbourne 13 April (4 days). *Inquiries:* Anthony MacDonald, The University of Melbourne email anti@itee.uq.edu.au, web www.cs.mu.oz.au/ASWEC04/home.php

**Symposium:** **3rd international symposium on foundations of information and knowledge systems** Vienna, Austria 17 Feb (4 days). *Inquiries:* web www1.informatik.uni-wuerzburg.de/databases/foiks\_2004.html

**Conference:** **22nd AIAA international communications satellite systems conference and exhibit** Monterey, CA, US 9 May (4 days). *Inquiries:* Chris Hoeber email hoeber.chris@ssd.loral.com, web www.aiaa.org

**Conferences:** **Gender & IT** Cadiz, Spain 6 Sept (3 days); **Psychology and IT** Cadiz, Spain 7 Sept (3 days); **MIS: Fourth international conference on management information systems, incorporating GIS and remote sensing** Malaga, Spain 13 Sept (3 days); **Data mining** Malaga, Spain 15 Sept (3 days). *Inquiries:* Wessex Institute of Technology +440 238029 3223, fax +440 238029 2853, email enquiries@wessex.ac.uk, web www.wessex.ac.uk

**Conference:** **12th european signal processing conference** Vienna, Austria 7 Sept (4 days). *Inquiries:* Conference secretariat +43 1 588 040, fax +43 1 586 9185, email eusipco@mondial.at, web www.nt.tuwien.ac.at/eusipco ●

### Playback video monitor

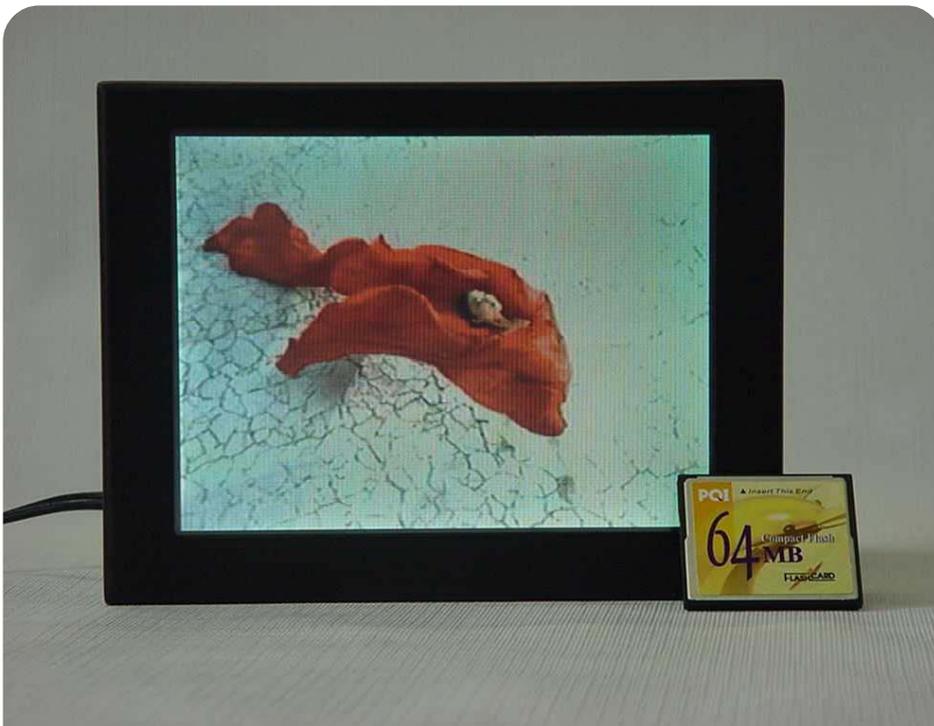
Amtex Electronics has introduced the 16.2cm Videoflyer, a solid state memory card playback video monitor.

A self-contained digital viewing monitor used for looping video display, the unit comprises of a 16.2cm colour TFT LCD panel. With the use of a plug-and-play CompactFlash card, video is stored and played in MPEG-1 video format and high-resolution MPEG stills can also be

used with or without audio. Video is programmed into the CompactFlash card by using DV Flashwriter software.

A heavy-duty aluminium enclosure houses the monitor along with 2W built-in stereo speakers and an optional jack out for external speakers. Autoplayback is used on power up, while continuous playback is used when looping video tracks. Playback options include any order track sequencing, selectable track length and manual startup of track after power up.

• *More information – Qikreply 18*



*Amtex Electronics' 16.2cm Videoflyer monitor.*

### Electronics design software

Altium, a developer of Windows-based electronics design software, has released a new product to provide a vendor-independent solution for system-level design on an Field Programmable Gate Array (FPGA) platform.

Nexar integrates hardware design tools, embedded software development tools, IP-based components, virtual instrumentation and a reconfigurable development board to allow mainstream engineers to interactively design and implement an embedded system inside an FPGA.

Benefits include parallel design of hardware and software; greater flexibility in hardware/software design partitioning; an integrated FPGA vendor-independent solution for putting embedded systems into FPGAs; and an interactive design environment for system-on-FPGA development and debug.

At the system level, Nexar provides a schematic-based design methodology to define system connectivity. It contains libraries of royalty-free, presynthesised, preverified IP components, including a range of processor cores, that can be dropped onto the schematic and connected together to form the system hardware.

Nexar components are processed for a variety of target FPGA architectures from multiple vendors. This allows design portability between FPGA device families and ensures a flexible vendor-independent approach to design. Nexar automatically and transparently selects the correct component model for the target architecture during system synthesis.

• *More information – Qikreply 16*

### Electronic control design

The MathWorks has announced the availability of its Embedded Target for OSEK/VDX and Embedded Target for Motorola HC12. Based on the company's Real-Time Workshop Embedded Coder platform, the products allow engineers to automatically generate and deploy code from Simulink directly onto mass production electronic control units (ECUs) as opposed to manually developing and integrating code.

The new Embedded Targets also satisfy the emerging on-target rapid prototyping market by allowing companies to develop and test new functionality on the embedded processors

of existing production or fleet vehicles rather than on rapid prototyping systems.

Automotive engineers can design, simulate and test control algorithms to generate code that can be downloaded to general-purpose ECU hardware for rapid prototyping or production deployment. This approach enables manufacturers to cut several weeks or months from the traditional design process by performing many design iterations early in a vehicle program.

The MathWorks software is distributed in Australia through ceanet.

• *More information – Qikreply 24*

For more information on any of these products, send an email to

[shollis@engaust.com.au](mailto:shollis@engaust.com.au)

with the subject headline "Monitor Qikreply".

Your contact details and the Qikreply number of the product should be included in the body of the email.