



DSP Based Carrier and Timing Recovery Techniques in Digital Modems

12–13 July 2007

Presenter: Prof. fred harris

The Grosvenor Room
The Olims Hotel Canberra
Corner Ainslie & Limestone Avenues,
Braddon, Canberra, ACT

Course Topics:

- Receiver Structures
- Maximum Likelihood Estimation (MLE) of Phase
- MLE of Timing
- Maximum Likelihood Frequency Estimation
- Polyphase Filters for timing recovery and band edge filtering
- Practical Consideration

The course will be conducted from 9.00am to 5.00pm. Morning tea will be available at approximately 10.00am to 10.30am, lunch from 12.30pm to 1.30pm and afternoon tea at approximately 3.00pm to 3.30pm.

Registration Fee:
AU\$1320 (including GST)

Early bird rates: AU\$1122 (incl. GST)
register before 30th April 2007

Group and PhD student discounts available. Please enquire.

For details of further courses please see our web site:

www.nicta.com.au/short_courses

or contact the NICTA Industry Education Manager.

About DSP Based Carrier and Timing Recovery Techniques in Digital Modems

Next generation Digital and Software Defined Radio Receivers must perform the tasks of carrier and timing synchronization as well as the first generation tasks of spectral translation and filtering to select and reject specific spectral bands. Modern digital radios perform the synchronization tasks entirely in the sampled data domain. As we transition these tasks to the DSP domain, we are well advised to review the fundamental first principles of synchronization and pose the question “what is the best way to synthesize solutions based on first principles”? We do so to avoid advancing legacy compromises that reflect old technology limitations as well as to take advantage of innovative options offered by new DSP technology. This **2-day** course presents the essential concepts of full DSP synchronization for timing recovery and for carrier recovery. The presentation emphasizes understanding of the processes and illustrates these processes with sample designs and implementations. Real time MATLAB simulations illustrate essential concepts.

Assumed Knowledge

Basic digital signal processing, basic knowledge in Communication Systems, Familiarity with Z-transforms, FIR filters, Sampling Theorem and Spectrum Analysis Techniques.

About NICTA and Short Course Program

National ICT Australia (NICTA) is Australia’s ICT Centre of Excellence and was established to drive innovation through high quality research, research training and technology transfer. As a world-class research institute NICTA uniquely combines excellence in research, education, commercialisation and collaboration. We are working to ensure that Australia is well placed to benefit from the significant opportunities that ICT research delivers.

NICTA is funded by the Australian Government as represented by the Department of Communications, Information Technology and the Arts and the Australian Research Council through Backing Australia’s Ability and the ICT Centre of Excellence program. NICTA members are the Australian Capital Territory Government, the New South Wales Government, the University of New South Wales and the Australian National University.

NICTA, with its extensive network of world-class researchers, is now offering a greater variety of short courses in an increasing number of locations in Australia and sometimes internationally. NICTA short courses connect research with industry by providing practical information from experts on how to solve key problems in industry and government. The Program offers scientists, engineers and managers technical training with a leading edge in areas such as telecommunications, transport, security, defence, logistics, e-government, mining, finance and biotechnology.

Course Topics

Receiver Structures: Parameters to be Estimated, Eye Diagrams, Constellations, and other Observables and Visualization Aides

Maximum Likelihood Estimation (MLE) of Phase: Phase Locked Loops and Digital Equivalents, Matched Filters; Decision and Non-Decision Directed, Squaring Loops

Maximum Likelihood Estimation of Timing: MLE Model and Approximations, Phase Detectors, Early-Late Gate; Decision and Non-Decision Directed

Maximum Likelihood Frequency Estimation: Frequency Matched Filter, Band Edge Filtering;

Polypulse Filters for timing recovery and band edge filtering.

Practical Consideration: Acquisition and Tracking Aides, Phase Detectors, Frequency Detectors; Direct Digital Synthesizers, CORDIC Algorithms

There will be ample opportunities for discussion and questions and answers. Morning and afternoon tea/coffee and a light lunch will be provided. Extensive workshop materials will be made available to participants.

Instructor: Professor fred harris

fred harris (sic) teaches at San Diego State University where he occupies the CUBIC Signal Processing Chair. His teaching and research areas include Digital Signal Processing, Multirate Signal Processing, Communication Systems, Source Coding and Modem Design. He has extensive practical experience in communication systems, high performance modems, sonar and advanced radar systems and high performance laboratory instrumentation. He holds a number of patents on MSP for Satellite and Cable Modems and lectures throughout the world on DSP applications. He consults for organizations requiring high performance, cost effective DSP solutions and has contributed to a number of textbooks and handbooks on various aspects of signal processing.

Please complete the registration form and send it together with your fee, if appropriate, **by no later than 30th April 2007** for early bird registration or **by no later than 29th June 2007** to

Anne-Marie Eliseo,
Industry Education Manager,
NICTA, SPRI Building,
Mawson Lakes Boulevard,
Mawson Lakes, South Australia, 5095.
Telephone: (08) 8302 3928
Facsimile: (08) 8302 3115
Email: anne-marie.eliseo@nicta.com.au

Registration Form and Tax Invoice* ABN 62 102 206 173

*Upon completion of this form, including the relevant payment, this form will become a Tax Invoice.

Please register me for DSP Based Carrier and Timing Recovery Techniques in Digital Modems on 12-13 July 2007.

PLEASE PRINT

Date: _____

Title: _____ First Name: _____ Surname: _____

Position: _____ Organisation/Division: _____

Postal Address: _____

Telephone No: _____ Facsimile No: _____ Email: _____

Dietary preference: _____

Course Fees: Early bird fees: AU\$1122 (incl. GST)
(Please register before **Apr 30th**.)

Full fees: AU\$1320 (incl. GST)
(Please register before **Jun 29th**.)

Method of Payment (please tick)

Cheque (payable to National ICT Australia Ltd)

Please forward cheque and a copy of THIS Registration Form to the NICTA Industry Education Manager.

Credit Card: _____ Credit Card No.: _____ Expiry Date: _____

Visa Master Card _____ Name on card: _____

Amount: AU\$ _____ Signature: _____ Tick if receipt required

Electronic Funds Transfer

Please advise by email to Annette Van Bramer
annette.vanbramer@nicta.com.au
when payment is made

BANK	Commonwealth Bank of Australia
ACCOUNT NAME	National ICT Australia Limited
BSB	062 900
ACCOUNT NUMBER	1032 4576
REFERENCE NUMBER	090707

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