

MICHAEL TSIROULNIKOV

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#449-5880 Dover Crescent, Richmond, BC, V7C 5P5

Professional skills:

- Digital signal processing theory & audio applications,
 - Adaptive systems, Acoustic and Network Echo Cancellers,
 - Fixed-point arithmetic 'know-how's, limitations and implications,
 - Applicable areas of mathematics (as stochastic functional analysis, etc) and numerical recipes,
 - DSP algorithm development methodology as a step-by-step feedback controlled process, to minimize time spent on troubleshooting, testing and maintenance.
- Experience in software / hardware architecture and building embedded systems (especially hard real time, performance oriented systems), system design & analysis, distributed systems, multitasking and multiprocessing, RTOS, device drivers.
- Telecommunication domain:
 - Voice over packet technology (starting from DCME / VoFR / VoATM / VoEthernet / VoIP), about 15 years of continuous hands-on experience;
 - TDM (T1/E1, SDH/SONET, DCE, local loops, PBX, gain plan, echo control, etc);
 - Customer-side (DTE/CPE) telephony & room acoustics.
- Experience in programming stretching from DSP / microprocessor assembly languages / Intel IA-32 SSE to Win32 C/C++.
- Proven record of designing clean flexible well-polished products requiring little or no maintenance, while standing agreed deadlines. Ability to go through entire path of R&D from advanced research papers to fully functional commercial applications.

Programming languages:

C / some C++ (to the degree usable for signal processing), Assembler of TMS320C55x / 54x / C5x / ADI 21xxx Shark / Intel IA-32/SSE / Freescale 56800E, etc, MATLAB, FORTRAN, etc.

Operation Systems:

MS ..., UNIX, VxWorks, VRTX, RMX-III, etc...

Education:

1978-84 | M.Sc. in technical cybernetics, Physics-Mechanics Department of Leningrad Politechnical Institute.

1992 | Course of RMX-III, software engineering standard (DoD-STD-2167A).

1993 | Course of C++, OOD.

Publications:

12 papers (system identification, adaptive filters & control, SAW device design and simulation, etc). The most recent (but not scientific, just technical type) paper:

http://dspvillage.ti.com/pdfs/edge/march2002_multirate.pdf

Visit www.miketdpsolutions.com for examples of algorithmic designs in source code (portable ANSI C and TI C55x/C54x assembly), and documentation skills.

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Employment History:

2000-present

MIKET DSP Solutions, sole proprietor www.miketdpsolutions.com. Developing high-performance DSP algorithms and providing DSP consulting services.

1. Design & implementation of low-MIPS CDPD GMSK modem for Sierra Wireless, Inc. on ADI 218x.
2. Design, development, integration & testing of embedded signal processing subsystem for Tri-Link Technologies VoIP / Ethernet soft PBX, including interfacing to call control plane, control envelope, adaptive jitter buffer, packet loss concealment (PLC as G.711 annex I), conferencing unit, drivers, test environment and tools, tone generators, etc.
3. Development of signal detectors for C55x/C54x, based on proprietary high precision short-term 'parametric' MLE-like spectral analysis
 - DTMF detector, run time configurable (0.25MIPS)
 - Multi-frequency (MF R.1, R.2) detectors (0.3 MIPS each).
 - Call progress (EIA 464+400Hz)
 - Caller Id and Caller Alerting Signal (Types I, II).
4. Research & development of high precision RLS-based line echo canceller for VoIP applications, providing up to 35 / 60 dB of ERLE on μ -law / linear codecs, wide DT range (up to 40 dB perceptual on μ -law codecs), fast convergence, dynamic range from -60 dBm, robust step-size control, Wiener NLP, for C55x & C54x.
5. Research & development of sub-band echo cancellers (both long-tail network and acoustic) for VoIP/ DTE / video-conferencing applications, based on the complex domain bi-orthogonal perfect reconstruction filter banks, dual Kalman filtering, psycho-acoustic Wiener post-processing (NLP), and Ephraim-Malah noise reduction. AEC: Echo tail up to 400ms, convergence speed up to 100 dB/s; TCLwst up to 50 dB, dynamic range -60...+6 dBm, noise reduction up to 15 dB. Improving echo path change / double talk detectors, experimenting with and in-depth studying of sub-optimal algorithms as FAEST, FTF, FNTF, FAP, Fast Kalman, Simplified FNTF, etc.
6. Co-operation with BC Cancer Research Department on algorithm research for limited data limited angle 3D image reconstruction techniques for microscope CT. New high-precision error-feedback based algorithms are discovered and analyzed. Articles published, and a patent (US Application #60/615,945) is in progress.
7. Licensing algorithms to *Tri-Link Technologies, Teltronics Inc, Connect Systems, Interval Media /Vulcan Research, Viack Corporation, Algo Solutions*, and others. Contracting and undertaking short-term employments.

2008-2011

Biamp Systems, Beaverton OR, Lead DSP Algorithm Engineer

1. Development of an AEC with sub-RLS (LEC-like) convergence and porting it to the ADI Shark platform (21363/21489), in full-band mode (48 kHz sampling rate), released as SONA(tm).
2. Development of a multi-point full-band AEC for tele-presence applications (so called MISO configuration), study into stereo AEC.
3. Porting a sub-band AEC on Motorola 56800E fixed-point platform to perform as a high-quality LEC capable to achieve fully transparent mode of operations in most conditions, so that NLP is rarely engaged.
4. Study of recent academic advancements in noise reductions and merging them with existing NR algorithm.
5. Study of recent academic advancements in super-directive and constant directivity beamforming for microphone arrays robust to phase / gain / position errors.
6. Participation in the development of a high-power low-distortions class D amplifier, research into both digital and analog implementations.
7. Development of a Win32 CobraNet recorder.
8. Mentoring junior DSP engineers.

2006-2007

Eyeball Networks, West Vancouver BC, Senior Engineer

1. Enhancing AEC (from MIKET DSP Solutions) to super-wide band mode (32kHz)

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- sampling rate). Porting AEC to Intel platform, algorithmic and assembly-level (SSE) optimizations.
 2. Full design and optimization of audio driver based on MS Direct Kernel Streaming and DirectX.
 3. Re-design of audio subsystem to provide near-real-time performance, with least intrusive logging and test point stream recordings, to ensure unit/beta/field testability and coverage, including adaptive jitter buffer, conferencing, test signal generator, .wav playing, etc – full transport layer of VoIP between network IF and soundcard.
 4. Integrating G.711, G.729 (from IPP), Speex, Siren14.
- 2005-2006** *VIACK Corporation, Redmond, WA, Audio Expert / Principal Software Engineer.*
1. Enhancing (licensed from MIKET DSP Solution) AEC to super-wide band mode (32kHz sampling rate). Porting AEC to Intel platform, algorithmic and assembly-level (SSE) optimizations, and integrating with MS Windows KS drivers.
 2. Re-design of audio subsystem to provide near-real-time performance, with least intrusive logging and test point stream recordings, to ensure unit/beta/field testability and coverage, including adaptive jitter buffer, conferencing, test signal generator, .wav playing, etc – full transport layer of VoIP between network IF and MS Audio Drvs.
 3. Selecting super-wide-band codec G.722.1 Annex C (Siren 14), integrating it into system/AEC/AGC and enhancing it with VAD/SID/DTX, while supporting various legacy codecs (G.7xx and Speex narrow band).
 4. Design and guiding the building compact anechoic chamber on budget (± 1 dB above 500Hz, more for lower frequencies due to size limitations) to ensure repeatability and consistency of measurement results and [regression] tests, based on ITU-T G.167, P.340, P.341, etc.
 5. Thorough measuring most commonly used desktop loudspeakers and microphones.
 6. Design and implementation of audio UI.
 7. Working through endless issues of running AEC in user mode on a MS PC platform with legacy soundcards, microphones and loudspeakers.
- 2005** *Polycom Canada Inc. DSP algorithm developer.*
1. Acoustic measurements and equalization of microphones / loudspeakers
 2. Fixing various problems of Polycom's Acoustic Echo Canceller.
 3. Wideband mode for both handset and handsfree.
 4. MIPS- and memory-optimized implementation of G.722 for C54x/C55x.
 5. System troubleshooting, code optimization, porting, etc
- 2000** *Spectrum Signal Processing Inc., responsible for technology in the Network Solutions department / senior DSP engineer.*
1. Development of 'C5420 based DSP resource card for VoIP / VoATM (AAL2) / etc. Trying to achieve design flexibility so that the same hardware could be used for different applications with software updates; allowing customization for applications different from 'universal port' model.
 2. Performing various duties as system architect, team & project leader, providing technical support of marketing activities, interacting with vendors and potential customers, hiring embedded and DSP engineers.
- 1999-2000** *Tri-Link Technologies Inc. (former Xinex Networks), senior DSP engineer / team leader*
1. "Next Generation" VoIP / VoEthernet Architecture System Design.
 2. Improved hybrid echo canceller with block affine projection method, extending dynamic range, enhancing DT detector, incorporating adaptive voice activity detectors {TI C54x, assembler, C}.
 3. Optimizations of Caller Id receiver for low-level signals (-65dBm) and twist up to 10dB {TI C54x, assembler, C}. Design & development of low-MIPS CP & DTMF detectors.
- 1998-1999** *Abatis Systems Corporation, Burnaby, team leader / senior firmware engineer.*
Design of VoIP card, including: board functional design, vendor choosing, software

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- porting & development, Call Control, H.323 stack interfacing, CAS processing, etc.), etc.
- 1996-1998** *Xinex Networks Inc., New Westminster, DSP team leader/ senior engineer.*
1. Design, Development & Testing of DSP subsystem of ATM-based integrated voice/video/data over LAN system.
 2. Speakerphone development & testing, including acoustical measurements and perceptual tuning.
 3. Design, Development & Testing of echo cancellers (both acoustic and hybrid); speakerphone algorithm (good for given hardware); Voice Activity Detector. {TI C5x, assembler, C}
 4. Design of CP, DTMF detectors & Caller Id receiver.
 5. Research & Design of Sub-band Acoustic Echo Canceller.
- 1992-96** *DSI Inc., Petach-Tikwa, Israel (on contract with ECI Telecom Ltd – now Veraz Networks.), System Design Group, DSP / system engineer.*
1. Embedded systems programming for SDH/SONET multiplexers {68302, C, VRTX}. Management of peripheral cards, where every peripheral card contains its own processor and some controlled ASICs, including control of card presence; software download and configuration; fault and exception handling; non-traffic-affecting update of software; etc.
 2. Development of software for a card providing communication between DS3 tributary (45M) and SDH ring.
 3. Leading of Object Oriented Design seminar.
 4. Co-architect of VoX platform (network of up to 512 DSPs). Development of system layer software for distributed processing of voice/fax/voice-band-data. {TI C54x, assembler, C}, which serves as a platform for VoIP / VoATM (AAL2) and DTX-480 DCME terminals. Used by all major carriers like Sprint, MCI, AT&T.
 - Functional design & simulation of ASIC for inter-processor communication;
 - Design of performance-optimized preemptive priority-based scheduler / RTOS for C54x, Inter-task communication, Memory management, Interrupt handling;
 - Design of fast reloading of applications on 40 Mbit/s to any DSP on the network; Bootstraps;
 - Software support of inter-DSP and DSP-controller communication, special debug channels for network testing / field debugging, (NetOS) etc.
 - Defining of generic application interface;
 5. Development & Testing of fax / voice-band-data remodulator for the DCME /VoX with memory minimization. Development of fax simulator with insertion of various impairments for testing of faxes, DCME, VoX, etc. {TI C54x, assembler, C/C++}.
- 1991** *Sensor Ltd., St.Petersburg, Russia, founder / senior software engineer.*
1. Design and development of a CAD to accelerate SAW device design, including adequate simulation of second order effects.
 2. Development of commercial databases {PC, Clipper}.
- 1984-91** *Radiotechnical Institute, Leningrad, USSR, engineer / senior engineer / project leader*
1. Design of algorithms and software for GPS receiver of GLONASS/LORAN navigation system signals. System integration, debugging and testing.
 2. Design & Testing of SAW filters and delay lines for communication, radiolocation and navigational systems, concentrating on low-loss precise devices, Development of supporting software.
 3. Working as a project leader and coordinator including negotiations with customers.
- 1980-84** *Polytechnical University, Leningrad, USSR. Student research work.*
1. Academic research of stochastic dynamic non-stationary linear adaptive control algorithms. Results published.
 2. Simulations of various adaptive algorithms, ranging from stochastic approximation to Kalman / RLS, for comparison of their performance. Results published.