Vol. 14, no. 3, Summer 1994

Array

Communications of the ICMA

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ARRAY
Summer 1994
Volume 14
Issue No. 3

***ARRAY* is the quarterly publication of the International Computer Music Association.**

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Publication of this *ARRAY* was made possible, in part, by a grant from the National Endowment for the Arts, USA.

ICMA News

ICMC 1995

Since 1974 the International Computer Music Association has presented the International Computer Music Conference in Canada, Denmark, France, Germany, Japan, Italy, the Netherlands, Scotland, and the United States. The first "Computer Music Conference", held at the University of Michigan consisted of David Wessel standing on stage and asking if anyone in the audience had any tapes to play!

"Music by computers" was certainly not an infant but very few practitioners had the vision to predict the scope and impact this tool would have on a world wide community of musicians and researchers twenty-one years later. ICMC 94 at Banff will greet a diversity of applications of computer music and sound and embellish the relationship of our computer music community to new media, popular culture and the creative arenas of our still expanding discipline.

Current activities perhaps suggest that the phrase "music by computers' be replaced with "music with computers". This attitude has been obviously reflected by the themes of the ICMC at least since 1992: Discovery/ Exploration (San Jose), A New Horizon (Tokyo), and The Human Touch (Denmark.) These themes seem to have an apparent culmination in the twentieth anniversary of the ICMC, Digital Playgrounds at Banff in 1995. The applications of digital technology to numerous techniques of sound synthesis and processing, interactive performance and composition, algorithmic processes, music representations and engraving currently provide the scientist and the musician with an extremely rich playground for explorations of new horizons with a human touch.

With the recent success of The Tuning of the World conference The Banff Centre for the Arts is an obvious choice for the 20th anniversary of the International Computer Music Conference (the conferences have been ongoing since 1974 but with the absence of a 1979 event the 1995 ICMC will actually be our twentieth.)

For over twenty years The Banff Centre has nurtured artistic and intellectual innovation. With a custom designed facility for a variety of performance media, a complete conference infrastructure, a history of support for the arts and related technologies, and the grandeur of the Canadian Rockies, this is the ideal location for the annual gathering of the diverse membership of the International Computer Music Association.

On behalf of the ICMA I extend thanks to the ICMC '95 Planning Committee:

The Banff Centre
Kevin Elliott, Chair
Daina Augaitis
John Avery
Rick Bidlack
Sara Diamond
Connie MacDonald

NOTICE TO CONTRIBUTORS

The deadline for submissions for the next issue of ARRAY, Vol. 14, No. 4, is **October 15, 1994**. All submissions to ARRAY must be in machine-readable form. You may submit items using electronic mail or on a floppy disk (either Macintosh or IBM 3.5" or 5.25"). If you submit anything solely as hard copy, it will not be considered for publication in Array. If you send a submission on floppy disk, please send two copies: one as a plain ASCII text file with carriage returns at the end of every line with an extra carriage return between paragraphs and the other copy as the file that your word processor uses.

Please do not use any formatting other than italics and bold face. We can only include MacDraw and MacPaint graphics with your article, so please provide them in these forms. It is helpful if you can include a hard copy as well. If you would like your disk returned, please include a self-addressed, stamped return envelope.

Send ARRAY submissions to :
ARRAY/International Computer Music Association
Suite 330, 2040 Polk Street
San Francisco, CA 94109
e-mail: array@cube.cemi.unt.edu

Robert Rosen
Keith Turnbull
University of Calgary
Tim Buell
David Eagle

and the Canadian Electro-Acoustic Community for undertaking the organization of this conference. I am sure the efforts of these people will result in an enjoyable and unique experience for the ICMA community. See you at the playground!

Allen Strange, President
ICMA

News From South America

Computer Music Workshop and Concert BOLIVIA

A two-weeks "Electroacoustic and Computer Music Workshop" was organized in La Paz, Bolivia, by the National Conservatory of Music and the Contemporary Music Association of that country. The workshop extended from April 25 to May 5 of 1994, and included topics like: new compositional techniques using computers, digital signal processing, sound synthesis techniques, computers on music education, live interactive performance with computers, multimedia and hipermedia, etc.

Ricardo Dal Farra (Argentina) was teaching this intensive workshop, and was also the coordinator of the computer music concert held at the "Puraduralubia" conference/concert hall on April 29. The program of the concert included the following pieces (several of them were presented for the first time in Latin America):

- "5 Scenes from an Imaginary Ballet", for CD-ROM, by Morton Subotnick (USA)
- "Pulsar: El Caribe" by Alejandro José (Dominican Republic)
- "Wall Me Do" by Carl Stone (USA)
- "Sexta Mayor" by Nicolás Suarez (Bolivia)
- "Homage (Dear John...)", a 1994 tape piece by Robert Scott Thompson" (USA)
- "Miniaturas", a group of brief tape pieces by Antonio Russek (Mexico)
- "[MUTE]ation", a 1994 tape piece by Brian Belet (USA)
- "Mambo a la Braque", tape piece by Javier Alvarez (Mexico)
- "Memorias", tape piece by Ricardo Dal Farra (Argentina)
- "Integrados", tape version from a piece for guitar and live electronics, by Ricardo Dal Farra and Arturo Gervasoni (Argentina)

This event was possible thanks to the efforts by Bolivian composers Nicolás Suarez and Alberto Villalpando.

National Rostrum of Electroacoustic Music ARGENTINA

The National Rostrum of Electroacoustic Music of Argentina awarded this year (1994) the following pieces: "Gaps" by Ricardo Nillni and "Chant D'Ailleurs" by Alejandro Viñao shared the first prize; "Tu casa o este océano" by Gerardo Dirié was awarded with the second prize; and "Seine sans e" by Daniel Schachter received the third prize. Two honorary mentions were for "Gritos y gritarras" by Teodoro Cromberg and "The Confession" by Sergio Schmilovich".

The jury of the National Rostrum of Electroacoustic Music was integrated this year by composers Claudio Alsuyet, Alejandro Iglesias Rossi and Enrique Belloc, with Ricardo Dal Farra as chairman.

The pieces awarded with the first and second prizes will participate at the International Rostrum of Electroacoustic Music (UNESCO) that will be held this year in Finland.

News reported by
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Letter to the Editors

ED. NOTE: This is in response to Stephen Pope's Letter to the Editor concerning the development of common music software practices in ARRAY, volume 14/1]

In a letter published in a recent Array, Steven Pope specifically addressed some criticisms and suggestions "to developers concerned about guaranteeing long-term usability and portability of their software packages". However, I do believe that reality and some of the conclusions one may regretfully deduce from it are contrary to Mr. Pope's suggested guidelines. And, acknowledging that the intent of Mr. Pope's letter was not necessarily to suggest any value system and instead to suggest a few "engineering principles", I suggest that perhaps there are alternatives to what he suggests developers should be concerned with, at the risk perhaps of making some value laden suggestions of my own.

So let's try reality first:

The generations of MUSIC 4 and MUSIC 360 have, despite actually conforming to not one of the lessons Mr. Pope hopes we have learned the importance of, have evolved and survived for about thirty years, and they continue to do so. MUSIC 360, as CSOUND, in terms of sheer ubiquity and resources consumed and transformed per unit time, is probably healthier than ever. The genes of MUSIC 4, in Cmix, RT, etc., and even MUSIC 360/Csound itself, continue to squirm out from under the latest rock.

HMSL is another case in point - there is no language that I know of that is more poorly standardized and dependent on low level interaction with the machine than Forth (in fact, one is tempted to ask "which Forth?"). But HMSL, like the hairy little mouse thing in the shadow of some doomed drooling reptile, seems against all of Mr. Pope's odds, destined to survive another generation. Forth is small and fast; a survivability tactic that is demonstrably hard to beat.

Now lets see what happens if I begin to compromise reality with a little bit of philosophy:

I am not tempted to deduce from the success of the MUSIC 4 genus that the "note-list" concept is in any sense the best. In fact, given even My Personal Convictions about Music, it may well be the worst. It is perhaps good only in the sense that a generation or so of students of the discipline have broken their teeth in trying to subvert it. And Forth certainly has little to do with My Convictions about reasonable programming environments, unless I'm trying to write portable ROM code.

So I am tempted to deduce from the apparent contradiction between reality and My Convictions that predicating the survivability of systems on anything having to do with My Personal Convictions may be misguided. The best way to ensure the survivability of ones software is probably to respond to an immediate need as quickly as possible (before someone else does), i.e., occupy a vacant niche. Unfortunately, immediate needs usually have nothing to do with My Convictions, Concepts, Holy Grails or Grand Designs and more often to do with such grungy low level things as incompatible file formats or useful old software that doesn't like expensive new machinery (SoundHack is a good example of a recent survivor that emerged from such grungy necessities).

Now here are the important lessons I hope we have all learned:

If you want to write software that will survive, first determine the need - a desperate need is best. Stay up all night and write a small, fast program in some ubiquitous, if imperfect, programming language. Promise a more elegant solution "sometime soon". If the program code is as long as the doc, you may have made a mistake. Put it some place where as many people as possible can get it for free, or nearly free. If you respond quickly you may be looking through some code a decade or so down the road and see something that looks pretty familiar, bent to fit into the next ubiquitous if imperfect programming language.

People talk of "not reinventing the wheel" as if to do so would be silly, but in fact the wheel itself is being endlessly reinvented, and it would be silly not to do so. The wheel is constantly being reinvented for the needs of the day. The space shuttle couldn't land on the wheels of an ox-cart. Were the wheel not being constantly reinvented, humanity may not have progressed beyond neolithic technological levels (and may have been better off for it, but that falls behind the aegis of "My Personal Convictions").

The question seems to me to be - survivability of what? It seems to me that the survivability of a culture, or a way of behaving regarding the applications of computers, or all technology for that matter, to music, is an issue beyond but perhaps even more important than the survivability of software packages.

"The organism that destroys its environment destroys itself". What really is our environment? Isn't it possible that the incredible INSTABILITY of the "computer music" community could be sufficient reason for its being. Perhaps the potential in music to learn about ourselves and our relationships to others is what is most valuable about it.

So do we really WANT long term stability of our environment, or of our tools? Is that even an issue? An organism in a stable relationship between itself and its environment is dead. In my case, the reflections on the relationships between my technology and the musical "system" as I understand it (and continue to learn to understand it) may perhaps be the most valuable information to emerge from my continuing experience with "computer music". I know this may not be true of others, but I don't think anyone can help but to start to ask questions about what one is doing and especially why when they are developing instruments, etc. I learn that the instrument is an extension of myself, and may on reflection decide that trying to understand the nature of my technological interaction with my environment is more important than God-like powers to "manipulate" sound.

And I really don't think there is any way to channel the emergence of such concerns, so let confusion continue to reign. We may learn something.

Dave Madole
Oakland, California (somewhere between Palo Alto and Berkeley, but very different than both)
madole@ella.mills.edu

Computer Music Calendar

The Computer Music Calendar is a resource for the ICMA community. Please send us notices of upcoming concerts – even though you may not draw in many new people from thousands of miles away, the rest of us can get a sense of work that is going on. Email event notices to array@cube.cemi.unt.edu, or send mail to the ICMA address listed in the Notice to Contributors on page 1.

SEPTEMBER

NAME: International Computer Music Conference
DATE: September 12 - 17, 1994
LOCATION: Aarhus, Denmak
CONTACT: ICMC 1994
Musikhuset Aarhus
Thomas Jensens Alle
DK-8000 Aarhus C, DENMARK
Phone: +45 8931 8171
FAX: +45 8931 8166
e-mail: ICMC94@daimi.aau.dk

NAME: Algorithmic Composition Workshop
DATE: September 25 - October 5, 1994
LOCATION: Zentrum fur Kunst und Medientechnologie
Institut fur Musik und Akustik
Karlsruhe, GERMANY
CONTACT: Zentrum fur Kunst und Medientechnologie
Institut fur Musik und Akustik
Ritterstr. 42
76137 Karlsruhe GERMANY
phone: 0721-9340-300
FAX: 0721-9340-39
e-mail: music@zkm.de

OCTOBER

NAME: Introduction to Digital Sound Synthesis Workshop
DATE: October 6-9, 1994
LOCATION: Zentrum fur Kunst und Medientechnologie
Institut fur Musik und Akustik
Karlsruhe, GERMANY
CONTACT:
Zentrum fur Kunst und Medientechnologie
Institut fur Musik und Akustik
Ritterstr. 42
76137 Karlsruhe GERMANY
phone: 0721-9340-300
FAX: 0721-9340-39
e-mail: music@zkm.de

NOVEMBER

NAME: International Conference on Auditory Display
DATE: November 7-9, 1994
LOCATION: Santa Fe, NM, USA
CONTACT: Gregory Kramer
Clarity, Nelson Lane
Garrison, NY 10524 USA
phone: 914-424-4071
FAX: 914-424-3467
e-mail: kramer@santafe.edu

MARCH 1995

NAME: CONVERGENCE —
The Fifth Biennial Symposium on Arts and Technology
DATE: March 2-5, 1995
LOCATION: Connecticut College,
New London, CT, USA
CONTACT: Center for Arts and Technology
Box 5365
Connecticut College
270 Mohegan Avenue
New London, CT 06320-4196 USA
phone: 203-439-2001
email: cat@conncoll.edu

JULY 1995

NAME: The 6th International Fuzzy Systems Association
World Congress
DATE: July 22-28, 1995:
CONTACT: Ms. Sandra Sandri,
Brazilian Institute for Space Research;
e-mail: Sandri@lac.inpe.br

Announcements

Job Offer at IRCAM

IRCAM is a leading non-profit organization of musical creation, R&D and education in acoustics and music, located in the center of Paris (France), next to the Pompidou Center. It hosts composers, researchers and students from many countries cooperating in contemporary music production, signal processing, acoustics and psychoacoustics and their interrelations.

One position will be available in October in the "Real-time platform" project in the R&D department.

The candidate will perform the following task: development of the 'Max' software in a multi-platform environment. 'Max' is a graphical user interface dedicated to musical applications.

Experience Requirements

- Excellent experience in C programming.
- Excellent experience in developpement of GUI on at least two of the followings : X/Motif, NeXTStep, Windows and Macintosh.
- Experience in software engineering techniques

Additional Helpful Experience

- Knowledge in digital signal processing and computer music.
- Network programming (Internet, TCP/IP)
- Use of multi-platform graphic toolkits and interface builders.

Salary

The salary range is FFrs 160,000-190,000 per year approx. ($32,000-38,000).

Availability

Position is available in October.

Please send resume and detailed work experience to the following addresses:

dechelle@ircam.fr
dececco@ircam.fr

Job Opening for System Programmer for Audio and Music at 3DO

Senior level programmer needed to develop and maintain operating system level audio and music software. Duties will include developing new realtime software synthesis programs for our proprietary DSP, developing system level tools for creating and controlling sound effects and music using the DSP, and writing example programs to demonstrate its use.

Required skills:

- strong 'C' programming experience
- operating system programming experience
- knowledge of digital audio and common music synthesis algorithms
- low level MIDI programming
- assembly language programming
- working knowledge of commercial music software
- experience with sound design and composition
- good writing and communication skills.

Bonus skills:

- DSP assembly language programming
- knowledge of advanced or experimental signal processing algorithms
- Forth programming skills
- ARM or other RISC assembly language programming
- knowledge of CSound
- CMix, or equivalent,
- knowledge of ADPCM
- MPEG or other compression techniques
- hardware design experience.

Qualified applicants please contact:

Phil Burk
3DO Company
600 Galveston Drive
Redwood City, CA, 94063
Phone: (415) 261-3100
Internet: phil.burk@3do.com

Announcing the Computer Music Journal Internet Archive and World-Wide Web Home Page

This archive is a set of files that are stored on two Internet-accessible servers—one at MIT and one at Stanford—for the use of CMJ readers and members of the computer music community in general. The "root" directories for the archive are "mitpress.mit.edu:/pub/Computer-Music-Journal" and "ccrma-ftp.stanford.edu:/pub/Publications/cmj." The archive includes the tables of contents, abstracts, and editor's notes for the last several volumes of CMJ (including the recent bibliography, diskography, and taxonomy of the field), a number of useful CM-related documents such as the full MIDI and AIFF format specifications, a lengthy reference list, the guidelines for manuscript submission, and the full text of several recent articles.

The files in these directories can be copied via anonymous Internet ftp file transfer, and there also is a World-Wide Web (WWW) "home page" in the file named "CMJ.html" that contains useful pointers into the archive (and elsewhere) and provides hypertext access for users of web browsers such as the NCSA's Mosaic.

The document reproduced below is part of the archives and describes its contents in more detail. Comments and suggestions are invited from readers/users about what is of use to you and what should be stored here.

Computer Music Journal Internet Archive README File

This document describes the files related to *Computer Music Journal* that are available from the Internet server mitpress.mit.edu in the directory /pub/Computer-Music-Journal and also in the directory /pub/Publications/cmj on the server ccrma-ftp.stanford.edu at Stanford.

The top-level directory has a Hypertext Mark-up Language (HTML) document for use as a "home page" with World-Wide Web (WWW) browsers such as the NCSA's

Announcements, continued

Mosaic. It is in the file named CMJ.html and contains useful hypertext pointers into the archive (and elsewhere). CMJ subscription information can be found in the file Subscribe.t. The file named ls.lR contains a UNIX-style full directory listing of the archive (i.e., the output of the UNIX shell command "ls -lR")

There are several kinds of files kept in the various subdirectories of the directory where this README file is found. The subdirectories contain:

Contents	tables of contents and abstracts from Computer Music Journal
EdNotes	editor's notes and commentaries
Authors	guidelines and templates for authors
Documents	other computer music-related texts
References	computer music reference lists
Texts	full-text of several *Computer Music Journal* articles

More details are given in the README files within each subdirectory, which are collected together in the file Index.t (ASCII) and Index.ps.Z (compressed PostScript).

Please send comments and suggestions about what you'd like to find here to the editors at CMJ@CNMAT.Berkeley.edu.

CONVERT v1.2B Now Available

Convert is a tool which translates samples among various instrument, musical and sample file formats, including the Ultrasound PAT format. It is easy to use and very powerful. It serves as a universal utility for interchanging samples between different applications and computers (support for varios Amiga, Apple, Next and Sun formats), and for extracting high quality instrument waveforms from some of best professional samplers (Ensoniq, Yamaha, Roland, Kurzweil).

The formats which Convert works in this version are the following:

SND	PCM Unsigned Raw Sound File
RAW	PCM Signed Raw Sound File
GKH	Ensoniq Disk Image (GKH and Giebler Enterprises)
INS, EFE	Ensoniq Instrument File
WAV	Microsoft Windows RIFF WAVE
PAT	Gravis Ultrasound Patch
UWF	UltraTracker WaveSample
ULT	UltraTracker Module
FSM	Farandole Composer WaveSample
FAR	Farandole Composer Module
669	669 Tracker Module (and Extended)
S3I, SMP	Digiplayer /ST3 Sample File
S3M	Scream Tracker v3 Module
MTM	MultiTracker Module
MOD	Protracker/Fastracker/Startracker Module
VOC	Creative Lab's Sound File
SDS	MIDI Sample DUMP Standard File
SDX	Sample DUMP Exchange File
SMP	Samplevision File
TXW	Yamaha TX-16W Wave File
SDK	Roland S-550/S-50/W-30 Disk Image
AU	Sun/Next Audio File
AIFF	Audio Interchange Format File
IFF	Interchange Format File
DMF	Delight Music File
KRZ	Kurzweil K2000 File

More formats will be supported by future versions. Please, contribute and send me descriptions or files of some format you have. Specially, I am very interested in EMU SoundFont Library (and some information about sampling management for Sound Baster AWE32), Sample Store (from Turtle Beach) and others pro formats (EMAX, Yamaha SY series).

convert12 available from:

archive.epas.utoronto.ca
in directory pub/pc/ultrasound/submit

For more information, contact:

Jesus Villena
jvillena@dsic.upv.es

Native Mode CSOUND for the Power Macintosh

The latest version of this port is located on beef.med.cornell.edu/pub. "CSound.ppc.hqx" is the binary app. "CSound.src.hqx" is the source with the Codewarrior project that I have been using. This will not compile with MPW. Many thanks to Christopher Weare for his help writing the sound manager code for the direct sound out.

New in this version (7-28-94):

1. Direct sound out through the Sound Manager. To use this enter "dac" as the output file. You can play with the buffer sizes (under the sample format menu) if Csound is not keeping up with your piece. I have been using buffers of around 10240 samples.

2. Analysis programs now work. I was able to make the Hetrodyne analysis/synthesis stuff work, but both the lpc and phase vocoder units seem to be a little freaked out. It would be great if I could get some feedback from people who have working .orcs.

New wish list:

1. Now that we have direct sound out we want midi in, hey look its a real cheap real-time software synth! That's cool!

2. Thinking about writing a Csound on steroids, adding all the things that I wish csound could do but can't.

3. Cool visual editing apps for the analysis files.

4. A multi processor 620 machine.

Please make sure you set the preferences to your liking. If you have any problems, questions, or would like to help out please write me:

erik@mail.med.cornell.edu.

Common Music for Windows 3.1 and ACLPC

I've placed a new release of Common Music on ftp.zkm.de and ccrma-ftp.stanford.edu containing a full port of the system to Windows 3.1 under Franz ACLPC Common Lisp. The low level driver interface for MIDI real time was implemented by Joe Fosco (email b38669@anl.gov). This release also has some new analytical operators for the Map command, see changes.text for more info.

Heinrich Taube
ZKM Computer Music Workshops 1994
Institute for Music and Acoustics
Center for Art and Mediatechnology, Karlsruhe
Germany

Announcements, continued

Open Music System (OMS) Developer's Kit

Opcode Systems

What is OMS?

The Open Music System (OMS) is a collection of software tools that manage the flow of MIDI information between applications and MIDI hardware.

A typical MIDI studio contains multiple MIDI devices attached to one or more MIDI interfaces. Without OMS, each individual MIDI application must keep track of all interfaces, MIDI devices and data communication. With OMS, all applications simply use the central, standardized MIDI communication offered by OMS.

What are the advantages of OMS?

OMS-compatible applications refer to MIDI devices by name. An application doesn't need to have any specific knowledge of how MIDI data is routed to and from a specific synthesizer or MIDI device OMS manages the flow of MIDI data automatically. As an example, a MIDI sequencer which uses OMS can refer to a MIDI device simply as Glens DX7 rather than something obscure such as Printer Port / Channel 11.

The relationships between MIDI device names, MIDI interfaces and channel assignments are managed by the OMS Setup application. With its icon-based user interface and on-line help, the OMS Setup program is intuitive and easy to use. If you change MIDI interfaces or connect your synthesizer to a different port, you need only run the OMS Setup to reflect the changes. Neither your OMS applications nor your saved MIDI sequences require modification.

Should I become an OMS developer?

If you write applications that communicate with MIDI devices, OMS is for you. If you manufacture MIDI hardware, you can develop OMS drivers so that OMS applications can communicate with your devices. Opcode Systems licenses OMS to developers free of charge and will send you the OMS Developers Kit at cost. Dozens of companies that manufacture and sell MIDI products, such as Digidesign, Passport Systems, Steinberg and OSC, have already become OMS developers.

What is in the OMS Developers Kit?

The OMS Developers Kit contains the following elements:

- OMS Application and Driver Interfaces: This document describes the routines and data structures used to communicate between your application and the OMS system.
- OMS Kit: This floppy disk contains the C header files, object code and examples you need to incorporate OMS support into your application.
- OMS Users Manual: This document provides a description of the OMS system and the OMS Setup application from the end-users point of view.
- OMS Installation Disk: This is a master copy of OMS that you are free to duplicate and include with your software. It includes the OMS Setup Application and related run-time support.
- OMS IAC Driver: The Inter-Application Communication driver provides four internal "software MIDI busses." Using the IAC driver, MIDI data output by one OMS application can be efficiently routed to the input of another OMS application. As an example, Lexicon uses the IAC driver to route controller information originating in Opcode's Vision sequencer into their NuVerb DSP card.

Opcode can provide production copies of the OMS Users Manual and the OMS Installation Disk at cost for inclusion with your shipping application. Contact Opcode for more details.

What else do I need to know?

OMS Version 1.2.1 runs on Macintosh computers running System 6.0.4 or greater. Opcode provides C language headers only; Pascal headers will be made available if there is sufficient demand. OMS Version 2.0 for Macintosh is scheduled for release in the first half of 1994. New features for OMS Version 2.0 include:

- timing services
- inter-application MIDI routing (IAC)
- support for named notes and patches.

Macintosh developers can take advantage of OMS right away; applications that incorporate OMS Version 1.2.1 will be compatible with Version 2.0. As a registered OMS developer, you will receive announcements about Version 2.0 and other relevant information.

Will OMS work with Windows?

Opcode is planning a release of OMS 2.0 for Windows in the first half of 1994. Developers can get a head start by ordering the current OMS Developers Kit. It will alert you to issues that you may need to consider when preparing your application for OMS.

How do I order the OMS Developer's Kit?

Call (415) 856-3333 and ask for Customer Support and say "I would like to order the OMS Developer's Kit (part # 201-0256-00)." Opcode charges for the raw materials and for shipping. The cost for the OMS Developer's Kit within the continental US (except California) is $16.83, in California (pesky tax) is $18.22, and in Canada is $18.83. Opcode accepts all major credit cards.

The BodySynth (TM)

A kick, a wave of the hand or a clenched fist, a ripple of the back, even a yawn or a scowl can make Muscle-Music. The BodySynth is a system for transforming movements, gestures, and other muscle efforts into sounds and other effects. Almost any muscle can be linked to the electronic circuitry. A flick of the wrist can be transformed into a wide range of sounds from a simple single note, to an arpeggio, glissando, or a sampled sound. A ripple of the back instantly becomes a musical statement.

The BodySynth is now available for use by other performers. It is completely functional as a stand-alone MIDI controller. Applications start with simple note triggers, pitchbend, continuous controllers, and other MIDI Voice Messages. Trigger and modulate sampled sounds. Modulate audio effects such as stereo echo and flanging with a MIDI audio processor. Extend your control to lights with a MIDI lighting board. The BodySynth links you directly with your computer for virtually unlimited applications as a Cyber Controller.

Announcements, continued

The BodySynth is a unique MIDI controller. It amplifies and analyzes the tiny electrical signals generated by muscle contractions (EMG or electromyogram). Input signals which are proportional to effort allow us to create or modulate a wide spectrum of notes and sounds from each muscle effort. Other sensors (12 total) can be easily incorporated into the system (e.g. tap sensors, accelerometers).

The BodySynth Basic System consists of four electrode sets, a Body Unit, and a Processor Unit. The BodySynth connects to an instrument-level (e.g. guitar) wireless system to allow complete freedom of movement throughout a theater. Options include: Eight muscle channels; auxiliary inputs for other signals sources; OptoCable for direct connection when a wireless link is not needed; customized systems.

Strap on simple electrode sets over the muscle(s) which will be the source of the sounds. The compact Body Unit provides initial amplification and conditioning for four EMG inputs. These signals are then transmitted using standard wireless technology to the remote Processor Unit. The processor has a large number of features used in further conditioning and responding to the input efforts. Under program control, it sends MIDI Note On, pitchbend, continuous controller, and other commands while various features such as Metronome, Peak Detector, Impulse Averager, and others are running. The BodySynth has been used in non-MIDI applications to emulate a "mouse" and to control the movements of robots. It provides interchannel modulation options, where one muscle may affect the signal from another muscle. It also can receive certain control and RealTime MIDI commands. It is completely functional as a stand-alone MIDI controller.

The BodySynth is also a powerful development platform for merging music and motion. A simple keypad and 64-character alphanumeric display make it a highly functional stand-alone controller, and of course the MIDI output can be fed into a computer for further processing. User-developed processing algorithms can be loaded into RAM in the processor via an RS-232 interface and run separately or in conjunction with pre-programmed features.

The BodySynth is the joint creation of choreographer/dancer Chris Van Raalte and engineer Ed Severinghaus. Chris has been working with dance and electromyography (EMG) for over 7 years. Ed designed and built the electronics, and produced the software which runs The BodySynth; he has worked with EMG signal measurement and analysis since 1976. Early technical contributions to the development of The BodySynth were made by Glenn Gutleben, Tim Perkus, and Steve Curtin.

When Chris performs with The BodySynth he triggers musical notes and effects via a digital synthesizer directly from the action of his muscles. The timbres, such as flute, percussion parts, guitar, or whatever sounds he makes are created in the electronic synthesizer. However, the pitches, the rhythms, and the phrasing you will hear are all created live by Chris and The BodySynth. Chris often works with dancer John Zane-Cheong. Together, they are The CyberBeat Brothers.

The BodySynth is available for performances and demonstrations of this intriguing combination of Art and Science.

For more information, or to arrange a demo or booking,

142 20th Ave. #2
San Francisco, CA 94121 USA
Tel. 415-387-1142
email - ed.s@sfnet.com

New Book from Curtis Roads: *The Computer Music Tutorial*

The Computer Music Tutorial is a comprehensive text and reference that covers all aspects of computer music, including digital audio, synthesis techniques, signal processing, musical input devices, performance software, editing systems, algorithmic composition, MIDI, synthesizer architecture, system interconnection, and psychoacoustics. A special effort has been made to impart an appreciation for the rich history behind current activities in the field.

Profusely illustrated and exhaustively referenced and cross-referenced, *The Computer Music Tutorial* provides a step-by-step introduction to the entire field of computer music techniques. Written for non-technical as well as technical readers, it uses hundreds of charts, diagrams, screen images, and photographs as well as clear explanations to present basic concepts and terms. Mathematical notation and program code examples are used only when absolutely necessary. Explanations are not tied to any specific software or hardware.

Curtis Roads has served as editor-in-chief of *Computer Music Journal* for more than a decade and is a recognized authority in the field. The material in his book was compiled and refined over a period of several years of teaching in classes at Harvard University, Oberlin Conservatory, the University of Naples, IRCAM, Les Ateliers UPIC, and in seminars and workshops in North America, Europe, and Japan.

Bound book date: 3/95
8x10" - 904 pp. - 504 ills.
ISBN 0-262-68082-3 $39.95 paper
ISBN 0-262-18158-4 $60.00 hard
Published by the MIT Press.

Call For Music: SYNCHRONIA

Synchronia, a chamber ensemble in St. Louis devoted to the performance of recent art music, seeks scores from contemporary composers.

Works submitted can be for any combination of flute, clarinet, violin, cello, piano, and percussion, with possible guitar, trombone, voice, or electronics. Contact:

Synchronia
P.O. Box 2937
St. Louis, MO 63130
Tel: (314) 6649313.

SoftSamp for Windows/CSOUND

SoftSamp1.1 for Windows is now completed and has been uploaded to the ftp site ftp.maths.bath.ac.uk in the /pub/dream directory. I also plan on setting it up on our

ftp site soon. SoftSamp1.1 runs in Windows, and is basically a sample playback system using CSound as the main engine.

This program will allow you to create Keyboard layouts for 16 different instruments that are then "played" by a standard midi file. The only limit on the number of samples you can use directly relates to how much memory you have in your computer (this also includes Virtual memory when running Windows). I am very interested in comments, critiques, and wish lists.

The name of the file to download is softinst.zip. Unzip this file in the directory that you wish to install SoftSamp and then read the README file for instructions on how to install SoftSamp. When you unzip softinst.zip the following files should be generated:

softsamp.zip
install.bat
readme.wri

Softsamp.zip contains the executable, and various drivers that the install.bat file will move to the appropriate directory on your C drive in the directory /windows/softdrvs. This process is explained in the README.wri file.

NOTE: Included in the softsamp.zip file is the current 486 version of CSound. SoftSamp will run on any PC (286,386,486), however, you must have the appropriate version of CSound installed and pathed on your machine in order for SoftSamp to run. I included the 486 version of CSound just to help out.

Dustin Barlow
M-Pact Center Electronic Music Department
Conservatory at the University of Missouri
Kansas City dbarlow@vax1.umkc.edu

IRCAM WWW Server

The IRCAM WWW server is now accessible on the Internet. It is, for the time being, only in french, and offers:

1. Information on IRCAM's activities in music (incl. the 94-95 musical season) and research (acoustics, digital signal processing, etc, together with sound illustrations).
2. Information on its degree-granting programs.
3. Access to Ircam's music library and sound archive catalogues for online searches, as well as to a bibliography of published papers by Ircam workers.
4. Ircam's publications and recordings, and how to order.
5. IRCAM's licenced software as well as its ftp server.

Moreover, it provides access to other WWW servers through thematic searches (by keyword, e.g.), in a database we created.

The URL is:
http://www.ircam.fr

4.0 Music Kit on CD ROM

For those without convenient FTP access...

The 4.0 Music Kit, which was released on FTP server late last year, is now available on CD ROM as part of "The Big Green CD 3.0". Both the installation package and the source code package are included. The CD, which also includes a wide variety of other public domain and shareware software for NEXTSTEP systems (including lots of sound/music software), is available from Skylee Press:

Skylee Press
P.O. Box 471645
San Francisco, CA. 94147
Phone: (415) 474-7803
Fax: (415) 474-7896
Email: disc@skylee.com

Call for Music for Digital Keyboard and Computer

I am presently composing a sonata for digital keyboard and computer which allows the computer to respond to my playing and react in musical ways. I am running my own midi software on the MAC and using the Peavey C8 as the controller. I'm giving a performance in Baltimore in January of 1995, and would like to include other composers' works.

If you are someone working in the area of keyboard-computer live interactive performance, and you are interested in having your work performed, please contact me.

Forrest Tobey
forrest@gigue.peabody.jhu.edu

New Degree Program

Universitat Pompeu Fabra
Institut Universitari de l'Audiovisual
& Fundacio Phonos
La Rambla, 31. 08002 Barcelona. Spain

Master In Musical Creation And Sound Technology

Introduction

Computers, and in general digital technologies, have revolutionized the music and audio field, not only technologically but also aesthetically. These machines, not only have facilitated many tasks, but they have also opened up new fields and creative possibilities unthinkable until now. As a result of these changes, in the last few years new academic curricula have been defined that are becoming common in several European countries and in the USA.

Addresses and Admission Requirements

This Master is addressed to all persons interested in musical and multimedia creation, both in its technical and artistic aspects. After completion of these studies, the participants will be able to use today's most advanced technological possibilities.

To enroll, students should have an undergraduate degree in one of these areas: Music, Engineering, Multimedia, Computer Science or any other degree related with these fields. Independently of the degree, experience in music and computers is a must.

Objectives

- To offer an integrated curriculum in the fields of Music and Sound Technology.
- To offer the needed academic founda-

tions and practical knowledge to carry innovative productions in the multimedia and music fields.

- To offer a musical program that fulfils today's musical needs.
- To offer technical studies on sound of interest to the people working the areas of music and multimedia.
- To get familiarized with the most current audio technology.
- To realize a practical project, related to either research or creation.

Structure And Schedule

The Master in Musical Creation and Sound Technology is made up of 384 school elective hours, plus an undetermined number of practical trainning, divided into two academic years. Each academic year is divided into two semesters, the first one going from the beginning of October to the beginning of February, and the second one going from mid-February to mid-June. Most of the classes are accompanied by practical work to be carried at the laboratories of Phonos and Institut de l'Audiovisual, outside the times of the lectures. Students have access to the laboratories during the week, and they can also use the UPF library. Enrollment is limited to 15 students.

To get the Master's degree the student has to present an original creative or research project related to one of the subjects.

Year	Sem.	Subject	hours/week
94-95	1st	Music theory	2
94-95	1st	Computer music	2
94-95	1st	Acoustics & psychoacoustics	1
94-95	1st	Electronics	1
94-95	2nd	Musical Analysis	2
94-95	2nd	Sound synthesis & processing	2
94-95	2nd	Programming techniques	2
95-96	1st	History of XXth century music	2
95-96	1st	MIDI & real time programming	2
95-96	1st	Digital recording techniques	1
95-96	1st	Music & sound in multimedia	1
95-96	2nd	Composition seminar	2
95-96	2nd	Computer music seminar	2
95-96	2nd	Multimedia aesthetics	1
95-96	2nd	Multimedia postproduction	1

Faculty

Ana Barjau (Ph.D. in Musical acoustics)
Gabriel Brncic (composer)
Perfecto Herrera (Psycologist and sound technician)
Joan Josep Ordinas (musician and computer programmer)
Eduard Resina (composer)
Xavier Serra (Ph.D. in Computer music)
Joan Trayter (engineer in sound and image)

The Master is coordinated by Xavier Serra and Gabriel Brncic.

Information And Registration

Institut Universitari de l'Audiovisual
La Rambla, 31
08002 Barcelona SPAIN
tel.: (34)(3) 412-3991
fax.: (34)(3) 412-4162

Music Available on WWW

For the first time in recorded music history, Quagmire presents in it's entirety, the first full length music album available on the World Wide Web FOR FREE.

A Western Front— Full Blown Dave

Here we have a snappy, full-blown and super sick collection of 16 pop songs that are sure to rattle your teeth and spit in your eye. Packed with sound in every nook'n cranny, this album has over sixty minutes of electric guitars which have never been taught to whisper.

These are MPEG compressed songs in full hi-fi stereo. Find it and find the future of music distribution. Download the songs then record them from your hard drive to a cassette, DAT, recordable CD or 8 track. Log off, shut down, go outside, breath in, listen and enjoy.

This is for FREE! This is the beginning, we will have much more to come...

To access,
URL= http://www.iuma.com/quagmire/

For more information, contact

ArtneT
post office box 2383
Los Gatos, CA 95031
info@quagmire-gls.com

Partial Listing of Audio Applications for SGI Machines

Midia - software only MIDI file player for SGI machines
Features include: Complete 88 key keyboard. Uses GUS compatible .pat files, stereo, mono, spatialization mode, transpose and tempo adjust, polyphony from 1 - 16 channels, online help, etc.
Contact: Mike Friedman (mae@access.digex.net)
From: archive.cs.umbc.edu
In directory: /pub/midia

Sox - apply echo/vibrato/bandpass/ conversion, etc. to audio file.
Sox (stands for 'SOund eXchange') is a sound transformation program (command line driven) which lets you re-sample, convert between many different audio formats, bandpass/lowpass filter, add effects such as echo + vibrato, amplify/attenuate, etc. Handles 1/2/4 channels. The source code is also available.
From: ftp.cwi.nl
In directory: /pub

Speech synthesiser - converts ASCII to speech
From: ftp.netcom.com
Filename: /pub/benoist/incoming/ speak.tar.Z
Is an SGI port of 'scat' a voice synthesizer. No need to compile - SGI binaries supplied.
Converter to SGI: Tom Benoist (benoist@netcom.com)

Real time spectrogram - wide band spectrogram for SGI's
Source and pre-compiled binary available.
From: ftp.york.ac.uk
Filename: pub/users/elec10/voice/ spect.tar.gz
Contact: David Rossiter (dpr@ohm.york.ac.uk)

MIDI routines - routines for sending and receiving MIDI from SGI's.
Simple routines for MIDI I/O and examples of use.
From: ftp.physics.mcgill.ca (132.206.9.13)
In directory: /pub/SGI/Home-Indigo
Author: Tom Benoist (benoist@netcom.com)

Announcements, continued

Netaudio - distributed audio (SGI and SUN) Client/server application built on the same model as X windows, multiple mechanism for distributed audio on a network, many other features.... (uses the X Consortium copywrite) (avalable for sgi and sun).

The latest release of the Network Audio System can be obtained:
From: ftp.ncd.com
In directory: /pub/ncd/technology/src/nas
or
From: ftp.x.org
In directory: /contrib/audio/nas

Release 1.2 of NAS is also included with the X11R6 contrib distribution.

nas@ncd.com is a mailing list for general discussion of the Network Audio System. Send a request to nas-request@ncd.com to find out how to get added to the list.

Pitchchanger - shifts pitch of SGI audio signal in real-time
From: louie.udel.edu
In directory: pub/music/software/unix
Author: ross-c@scs.leeds.ac.uk

Spectra - miniature version of the standard SGI audio panel
Spectra is a stand-alone program which is designed to replace the traditional Audio Control Panel supplied by the Silicon Graphics with a much smaller, and sleeker, display. This display may be kept always active on your display due to the minimal screen area it occupies. (22 pixels width!!) It has one or two extra features over apanel, such as automatic clipping adjustment.

From: swedishchef.lerc.nasa.gov (139.88.54.33)
Filename: spectra.tar.Z
In directory: /programs
Author: David Cook (dcook@npal.rn.com, iceman@cerf.net)

CSound - C based language for audio generation. The famous control language for sound and music generation.
From: cecelia.media.mit.edu (18.85.0.104)
In directory: pub/Csound

Patchwork - X based graphical front end for CSound

Patchwork is a GUI for CSound. It can generate the ascii, compile the code, and play the resulting sound all from one pull-down menu option. There's an indigo executable and all the source code as two tarred, compressed files. Only about half the csound unit generators are currently supported, but "someone is working on adding the rest".

From: emx@utexas.edu
In directory: pub/music/indigo
Coordinator: Russell Pinkston (music@emx.cc.utexas.edu)

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dspB - sound editor that doesn't edit!
This is really only useful as example source - i.e. for X windows coding or for the fft routines. Compared to SGI's soundeditor, dspB is less pretty and does not support editing (oops). It does have some other features, like fourier analysis. It should compile on an indigo without any trouble. One problem: it cannot read the AIFC files that the SGI 4.0.5. audiofile library writes. It can read AIFFs, of course.

The pvoc subdirectory contains the program pva which performs short time fourier transform analysis of sound files. You might be able to view the results with dspB, or you can resynthesise the sounds with non-pitch-modifying time stretches using pvi.

From: cecelia.media.mit.edu (18.85.0.104)
Filename: pub/dspB1992may20.tar.Z
Author: Dan Ellis (dpwe@media.mit.edu)

---

erase - cancels SGI audio signal common to both channels in real-time
From: louie.udel.edu
In directory: pub/music/software/unix
Author: ross-c@scs.leeds.ac.uk

---

shorten - lossless compression for audio files
Shorten reduces the size of audio files using Huffman coding of prediction residuals. The amount of compression obtained depends on the nature of the audio signal. Those composing of low frequencies and low amplitudes give the best compression. Compression is generally better than that obtained by general purpose compression utilities applied to audio files.

From: svr-ftp.eng.cam.ac.uk
Filename: misc/shorten-0.4.shar
Author: (Tony Robinson) ajr@jam.eng.cam.ac.uk

Sounds - hundreds of sounds in .au format
From: sounds.sdsu.edu
In directory: sounds

Free software list - for Silicon Graphics machines
Standard, regularly updated list of SGI software available via anon ftp.
From: pit-manager.mit.edu
In directory: pub/usenet

Audio formats - List and explanation of many different formats
A very good and very comprehensive list of audio file formats is prepared by Guido van Rossum. It includes information on sampling rates, hardware, compression techniques, file format definitions, format conversion, standards, programming hints and lots more.
From: ftp.cwi.nl
In directory: /pub
Filename: AudioFormats<version>

Music technology FAQ - Frequently asked questions on mustech things
FAQ on electronic and computer music
From: xcf.Berkeley.EDU
Filename: misc/netjam/doc/FAQ/FAQ.entire

Speech technology FAQ - Frequently asked questions on speech things
FAQ on comp.speech
From: svr-ftp.eng.cam.ac.uk
Filename: /comp.speech/FAQ

IRCAM bibliography - Bibliography of papers from the French research centre
A (yet partial) bibliography of articles, theses, books etc... written at Ircam or in conjunction with work at Ircam has been put on our anonymous ftp server.
From: ftp.ircam.fr
In directory: /pub/IRCAM/doc

Computer music bibliography - useful and fairly comprehensive
From: ftp.cs.ruu.nl (131.211.80.17)
Filename: MIDI/DOC/bibliography or by mail from mail-server@cs.ruu.nl (send a message with HELP in the body).

MIDI free programs + files - masses of MIDI information
List and directions kept at ftp.cs.ruu.nl (131.211.80.17)
In directory MIDI.

AIFF file format - structure of audio file format.
aiff-c specification
From: sgi.com
In directory: /sgi, called aiff-c.9.26.91.ps

Music related email groups - enormous list
Available at cs.uwp.edu (131.210.1.4)
Managed by: mlol@wariat.org

Articles on (fairly contemporary) music composition
From: ftp.hyperion.com and cs.uwp.edu
Author: fields@eecs.umich.edu

Updated versions of this listing are available from:

ftp.york.ac.uk
as
/pub/users/elec10/voice/audio_goodies.txt

www access via: file://ftp.york.ac.uk/pub/users/elec10/voice/Welcome.html
(page location may change)

Dave Rossiter
Research Associate
Department of Electronics
University of York
York
England
YO1 5DD
dpr@ohm.york.ac.uk

Last Call - Handbook of Musical Codes

The Handbook of Musical Codes, under preparation since 1991, is nearing completion. Substantial coverage is given to notation codes (DARMS, SCORE, et al.), sound codes (MIDI, Csound...), multi-use codes (Kern and MuseData), conversion codes (SMX and HyTime), and task-oriented codes (ESAC, Plaine and Easie, SCRIBE, TabCode, Braille music notation and much else).

If you are the originator of a special-purpose code and have not previously contributed, you may send a SHORT description (not more than 100 words) stating the code name, place and date of origin, main purpose, major features, and material encoded. This must be accompanied by complete postal address information.

The Handbook of Musical Codes is being prepared under the auspices of the International Musicological Society Task Force on Musical Data and Computer Applications. Its purposes are to increase familiarity with the basic provisions of codes in widespread, open use and thereby to provide an enlightened forum for the discussion of the problems of musical data interchange in the scholarly context.

If you wish to be notified when the handbook is complete, please send your name and full postal address to Nancy Solomon at
ccarh@netcom.com

or to the postal address given below.

Eleanor Selfridge-Field
Center for Computer Assisted
Research in the Humanities
525 Middelfield Rd., Ste. 120
Menlo Park, CA 94025-3443
esfccarh@netcom.com

Looking for Fuzzy Music Free Trip to Brazil

The 6th International Fuzzy Systems Association World Congress will be held 22-28 July, 1995 in Sao Paulo, Brazil.

The organizers are actively looking for researchers/developers using fuzzy systems in musical applications.

For more information, please contact

Ms. Sandra Sandri
Brazilian Inst. for Space Research
Email Sandri@lac.inpe.br.

Call for pieces: Sonic Arts Network (UK)

I'm programming concerts for Sonic Arts Network (UK organization for computer/electroacoustic music) and am looking for pieces for

(i) two percussionists and tape.
(ii) two percussionists

(normal percussion - vibes, marimbas etc, plus one player is a Latin-American specialist too)

If you have, or know of, pieces that you would like to submit or suggest, please either contact me by email or send scores/tapes to:

Katharine Norman
Projects Director
Sonic Arts Network
Francis House
Francis Street
London SW1P
UK

No deadline - but we have to start making decisions by the end of September.

Concerts in Feb 1995 at the South Bank, London.

Segundo Festival de Compositores Latinoamericanos ECUADOR

The "II Festival of Latinamerican Composers" will be held at Quito city, Ecuador, from November 15 to 18, 1994.

During the first festival (1991) several electroacoustic and computer music pieces were programmed, and the same is being planned for the concerts of this year's festival.

For more information, contact:

Pablo Freire
Conservatorio Nacional de Música
Casilla 17-12-512
Quito
ECUADOR

Foot-tapping:
A Brief Introduction to Beat Induction

Peter Desain and Henkjan Honing
NICI, Nijmegen, University of Amsterdam
NETHERLANDS
desain@nici.kun.nl
honing@mars.let.uva.nl

What is this?

As an example, have a look at the following pattern of lines and dots:

I..II.....I.I..II.....I.I..II

Do you see any emergent structure? Probably not. When you would listen to it, though, (e.g., the pattern being played from left to right, with every line being a 16th note and every dot a 16th rest) you would quickly hear a regular pattern (the beat), and could probably easily tap your foot along with it. This relatively simple cognitive task is called beat induction or foot-tapping.

Beat induction is a fast process. Only after a few notes (5-10) a strong sense of beat can be induced (a "bottom-up" process). Once a beat is induced by the incoming material it sets up a persistent mental framework that guides the perception of new incoming material (a "top-down" process). This process, for example, facilitates the percept of syncopation, i.e., to "hear" a beat that is not carried by an event. However, this top-down processing is not rigidly adhering to a once established beat-percept, because when in a change of meter the evidence for the old percept becomes too meager, a new beat interpretation is induced. This duality, where a model needs to be able to infer a beat from scratch, but also to let an already induced beat percept guide the organization of more incoming material, is hard to model.

There are a number of aspects that make beat induction an interesting and important process to model, as is shown through the joint efforts of researchers in this field. Many individual papers elaborate on the different aspects of this process. Their diversity reflects the large body of work on the subject and the different computational formalisms used (Rule-based systems, Optimization methods, Search, Control theory, Distributed systems, Minskian models, Neural nets and Statistical models to name just a few).

Interactive computer music systems

Interactive computer music systems make some interesting additional demands besides those mentioned above. First, they have to perform in real-time, which means that they have to be efficient enough and that they have to deal with the musical material incrementally (i.e., while the input is processed). They also have to deal with real performance data (containing expressive timing, performance errors, etc.), these systems have to be robust (i.e., they should recover gracefully from errors), they have to deal with instruments that exhibit some response delay (like mechanically driven pianoUs or shoes), and to do this, they need careful temporal planning (i.e., scheduling).

Most of these systems, though, have only been informally tested. It is unclear how well they deal with the characteristics mentioned above. However, the interactive performance situations for which these systems were designed, forced the designers to think of solutions on problems that are rarely touched in cognitive models, problems that can not be ignored when aiming at a realistic cognitive model of beat induction.

Unfortunately, neither cognitive nor technological approaches have been able to arrive at a general, robust beat extraction method. The big challenge seems to lie in a unification and generalization of the existing, partially successful theories, since they all apparently model at least one valid aspect of beat induction. We hope that the special ICMC 1994 paper session on foot-tapping can make a contribution towards this goal. To enable the audience to compare their own foot-tapping with that of the presented models, some of the computational models will be demonstrated with on-line computer implementations connected to a mechanical foot-tapper.

A special "foot-tapping" session devoted to this area of research will be held at the 1994 Aarhus ICMC, with papers from the session published in a special section of the *Proceedings* (thanks to Steffen Brandorff for finding support for this topic in the form of time and space in the ICMC program).

The papers that were accepted by the ICMC paper committee are:

Richard Parncutt,
McGill University, CANADA
A Model of Beat Induction Accounting for Perceptual Ambiguity by Continuously Variable Parameters

Peter Desain and Henkjan Honing,
NICI, Nijmegen, University of Amsterdam
NETHERLANDS
Rule-based models of initial beat induction and an analysis of their behavior

Ed Large
Ohio State University, USA
The Resonant Dynamics of Beat Tracking and Meter Perception

David Rosenthal, Masataka Goto and Yoichi Muraoka,
International Media Research Foundation, JAPAN
Rhythm Tracking Using Multiple Hypotheses

Neil P. McAngus Todd,
University of Sheffield, ENGLAND
An auditory model of rhythm perception

Peter Desain and Henkjan Honing,
NICI, Nijmegen
University of Amsterdam
NETHERLANDS
Advanced issues in beat induction modeling: syncopation and expressive timing

Performing the Universe Symphony

Thomas Haines
Electronic Media Division
University of Cincinnati
Thomas.Haines@uc.edu

[ED. NOTE: Last April, the Cincinnati Conservatory of Music performed a version of Charles Ives' unfinished *Universe Symphony*, with the completion of it composed by Larry Austin. The performance was an unqualified success, captivating the capacity audience with its energy and sheer sonic force. A short tour of the music and a discussion of some of the technical problems encountered "behind the scenes" are discussed in the following article.]

Imagine entering a concert hall being greeted by an usher who escorts you to a center stage seating area. All around the perimeter of this area are literally hundreds of players in eight separate orchestras. These orchestras are divided in unusual groupings. Basses and cellos in one, high strings in another and one comprised of nothing but percussion instruments. As the performance begins, the process of growth, seemingly organic, from a single pulse slowly becomes a wonderfully complex din of ever-changing subtleties which transforms itself and you, the listener, into a singularly living thing. This "thing" was imagined by Charles Ives some eighty years ago — the *Universe Symphony*.

The *Universe Symphony* was first sketched between 1911 and 1915. Ives resumed work on the sketches in 1927 and 1928. He revisited the *Universe* again three years before his death in 1954, never completing the massive work. It is doubtful that the *Universe Symphony* would ever have seen a performance in Ives' lifetime, even if he had finished it. Ives suggested that the piece be played in the Grand Canyon with orchestras perched on various peaks surrounding the audience.

Earlier this year, I had the opportunity to participate in the realization of a somewhat more modest (non-Grand Canyon) stage production of the *Universe Symphony*. Working from Ives' sketches and other material, Larry Austin (former ICMA president) created a finished version of Ives' dream symphony. Under Austin's direction, I was given the task of implementing the mechanical aspects of the performance. This was a daunting task: 25 sets of headphones being fed 14 separate cue track sync tones in varying combinations of performers all at the same time — without being noticed!

In order to fully appreciate the concepts defining this project, I will outline a brief overview of the work itself from a historical and theoretical perspective. This is followed by my personal experiences with the technical means of the performance and some final thoughts.

Historical/Theoretical Perspective

Austin began work on the completion of this project (started by Ives in 1911) in the late 1970's. The first portion of the music to be finished was the opening percussion section, the *Life Pulse Prelude*. Ives' original sketches were detailed enough to allow a fairly straightforward realization of this *Prelude*. In 1994, fifteen years after the completion of the percussion prelude, the final version of the Austin/Ives *Universe Symphony* was brought to the stage for the first time. The *Symphony* was performed at the Cincinnati College-Conservatory of Music by the Philharmonia Orchestra with Gerhard Samuele conductor (a compact disk of the performance will soon be available on the Centaur CDCM Computer Music series). It should be noted that this performance was done with all orchestras "on stage" and the audience in the usual seating arrangement. (the Grand Canyon had already been booked!)

In a sense, the piece is a large experiment, incorporating many aspects of Ives' own metaphysical ideas about life and the universe. (For more information on these ideas and how they were woven into the fabric of the music, see Austin's article in *Percussion Notes Research Edition*; September, 1985.) Ives' transcendental vision of an ordered, timeless universe serves as the model for this complex compositional form. The progression of the work cycles through the process of uninterrupted sections entitled *Past, Present and Future*. Ives also used musical concepts related to "Earth", "Rock Formations", "Clouds" and the aforementioned "Life Pulse" to round out the elements used in the basic construction of the piece. The "Life Pulse" is the dominant force throughout the piece. Each of the eight orchestras are aligned with one of these elements. Ives conceived of these disparate elements as interacting according to definite mathematical relationships — art and technology coming together indeed. The methodical relationships behind this work are the genesis for its structure in musical, technical and performance areas, a case where form certainly follows function.

The composition itself describes a strict arch trajectory: the second half is an exact mirror image of the first half of the cycle (in reverse). This mirror image helps create an effect I like to think of as the "life-pulse effect"; a sort of durational counterpoint in which predetermined metric and pitch ideas are spread in time across a wildly varying rhythmic base.

As an example, in the opening section (the *Life Pulse Prelude*) the "life pulse" — performed on percussion instruments — is conceived by Ives as the motif of mankind. It is built by a mathematical combination of basic rhythm patterns, based on stacked time signatures comprising a prime number sequence. The relationships of these rhythms strike me very much like organic cell division, at once chaotic and ordered. Twelve different divisions of the beat were used in the *Life Pulse Prelude*; fourteen separate pulse-divisions are used in the entirety of the *Universe Symphony*.

The *Life Pulse Prelude* itself was the earliest of Ives' sketches, found in nearly completed form (although much of it was more implied than written out). The score calls for twenty percussion parts (including a single piccolo, oddly enough) composed all in different meters and tempi. These are designed to come into phase every eight seconds (when the prime number sequences align), with the point of alignment punctu-

Universe Symphony, continued

ated by a low, deep, hanging bell. These phrases are bundled in twenty-four bar units, with ten iterations of this basic unit completing one cycle of the "life pulse". Each iteration is identical to the previous in pitch information, with slight variations occurring in rhythm, dynamics and texture. The beginning volume is nearly inaudible. The volume slowly grows through the iteration process, reaching excessive levels at the midway point. This midpoint lasts three iterations, with the the volume slowly decreasing to near inaudibility again during the last four iterations or the ten.

Towards the end of the opening *Prelude*, the remaining orchestras, seven in all, begin to join in. These orchestras are conducted by either the main conductor or by individual associate conductors, each with their own pulse to follow. The remainder of the piece is built through the layering of these separate orchestras on top of the *Life Pulse*, finally winding down to the bare pulse (the mirror/arch form) to the end of the music.

Technical Aspects of Performance

The performers and conductors could follow Austin's score by counting along with the ubiquitous eight-second bell chime (this was Ives' original intention — the bell could be heard at some distance away, providing a means of synchronizing the scattered orchestras). Performing this task while counting their individual parts proved overwhelming for the players, however. Recognizing this difficulty, Austin devised a synchronization pulse system for use in performance.

The system created by Austin was designed to give each individual player (or group of players) their own unique pulse. This was accomplished by using the multi-track tape technology available to Austin at the time he realized the *Life Pulse Prelude*. The fourteen pulses were painstakingly synchronized by Austin in an audio studio on a 16-track tape machine prior to any rehearsal or performance. During performance, each player would be supplied with their own unique "life pulse" via a headphone distribution system which would have to supply a minimum of twenty discrete foldback loops!

The individual pulse tracks were also enhanced to help in performance. At the end of each measure, Austin inserted a quiet major triad to give the performer a sense of the intended phrasing. Much like a visual cue given by a conductor, this harmonic chord began on the last pulse of the phrase and was completed at the downbeat of the beginning of the next phrase. Additionally, scattered verbal cues on the tape indicated exact score positions corresponding to rehearsal markings.

During performance the volume levels reach an extremely loud level which is sustained for nearly ten minutes (what a glorious din!). The vital click track information carrying the life pulse timing can be lost at such extreme volumes. Each performer has to be supplied with individual volume controls to compensate for any volume loss or masking of the pulse during such loud passages. When the music returns to its opening/near-silent volume levels, the performers require considerably less volume in the click track system. If too much of the headphone clicks are present, the delicacy of the extremely quiet passages that open and close the work will be ruined by the ugly reminder of intrusive technology. Technology is always ugly when it gets in the way no matter how important its basic function.

Re-creating a system to furnish the sync pulses to the performers was a formidable undertaking. In all, twenty-five pairs of headphones were used to supply twenty performers and five conductors. As I mentioned earlier, fourteen click track "pulses" were needed to properly synchronize the performers and conductors to their portion of the score. These click tracks were terminated into a conventional military-type patch panel from a battery of stereo amplifiers which were fed by an E16 Fostex multitrack tape machine playing the pulse tape. Each headphone station was supplied with a passive volume control to attenuate the pulse signal sent to it during the quiet sections. The headphone distribution system had been designed and constructed for earlier performances of the *Life Pulse Prelude* alone. Portions of this system (the patch panel, the headphone distribution network, pulse tape) were shipped to us ahead of the scheduled opening and rehearsal dates. Simple, huh?

Needless to say, we had a next-to-nothing equipment budget and not nearly enough equipment in supply to meet the remaining system requirements, so we had to improvise. Our 'shopping list' of equipment included: 25 sets of headphones, 10 stereo amplifiers, individual attenuators for each headphone station, the 16-track tape machine, and cable enough to wire the whole thing three times over.

In an effort to spread the burden of equipping this venture, we asked everyone involved in the performance to bring any piece of hardware that might help meet the system requirements. Personal headphones were readily available, and we eventually managed to get our hands on enough amplifiers and cables to put everything together.

The initial run-through was a disaster. There were so many problems that it was impossible to trace down any single problem area. Undaunted, we pressed on... the sync system was completely reconfigured and redesigned six times, and totally (from the ground up) rewired three separate times! (This doesn't count all the trouble-shooting of the system in-between the major overhauls). Of course, being an "academic" venture, we were relying upon extremely limited budgets and resources.

The technical difficulties fell into four categories: amplifiers, headphones, cables and volume controls (that about covers the spectrum of the distribution system, I think). The tape machine performed flawlessly, and our fears that the older tape might break under the stress of transport in the rehearsals were unfounded. None of the problems were completely cleared on the first or even the second attempt; some of the problems were never totally solved. The first fix involved tracing individual cables to particular problem headphones. We then traced and checked for cable failure, only to eventually discover that some of the amplifiers were not functioning shortly after the system was powered up.

The main source of many of the problems was mismatch of level impedances. This

Universe Symphony, continued

mismatch manifested itself in two ways — first at the patch panel after the amplification stage and second at the individual volume controls supplied to each performer.

The first problem in the signal path was the connection between the amplifiers and the patch panel. The fourteen pulses (tracks) were divided into uneven groupings. A total of five headphone sends were used for the first click pulse (recorded on track 1 of the tape). Four headphone sends were required for the second track, perhaps two or three were needed for the third track, and so on. This "uneven" distribution of headphones per track caused a mismatched impedance load for the amplifiers. When a power amp "sees" a non-balanced or uneven load across the two outputs, the output stage begins to overheat, causing them to trip an internal circuit breaker after a short period of time. Under these conditions, the amp shuts down. Because of the nature of this difficulty, any problems wouldn't surface until well within the running of the piece. The solution was to use some of the amplifiers in mono mode thus eliminating the mismatch. This meant, of course, that still more amplifiers were needed to complete the system.

This problem was also compounded by the volume controls at each headphone station. The headphone volume control boxes were fitted with standard pre-amplifier stage electronics consisting of a volume potentiometer and a pair of input/output connections. Because these volume controls were working after the amplification stage, the relative signal strength is greatly increased from the "normal" levels seen in a typical pre-amplifier stage. An fully-amplified signal is meant to travel through components that have a fair amount of inert mass or resistance, such as a loudspeaker. The amplified signal was far too intense for the individual volume control boxes designed and built for the system. Consequently, the amplified signal overheated and destroyed the fragile components inside (some actually caught on fire!). The end result was that after a period of time, the volume controls would begin to act more like on/off switches rather than a smooth volume attenuator. This problem was never totally solved, but we managed to work through it... somehow.

The night of the performance came and went with only a slight hint of technical malfunction, and that was due to human error. During the recording of the work for the Centaur CDCM compact disc, we managed to pull the fading of the click track to low enough levels "by hand" that none of the dozen or so microphones used were able to pick up any trace of headphone bleed.

Final Comments

A word about performance aesthetics: This piece, perhaps more than any other, works better in theory due to its unusual requirements. The experience of realizing this piece in a concert setting is certainly worth any obscure performance requirements. However, the sonic relationships of the eight different orchestras that were so clearly specified (in theory) fell short of their intended goal in practice. For this particular performance, the failing was due in large part to the restricted space, the placement of the audience, and the number of players available.

Some possible solutions could have been amplification of some of the orchestras and placing speakers at the rear of the house. This would solve the problem of balance as well as more closely following the intentions of the composer(s) by surrounding the listeners with sound. In recording or playback, this work would be ideally suited for "surround-sound" applications like the true five-channel sound systems used in movie theaters, or (better yet) the multi-channel surround system used in Omnimax theaters.

Imagine an interactive system where the eight orchestras are moveable in reference to playback system within a 360-degree area. The listener could choose a seat in that virtual space and position the orchestras at will. in such an environment, the diverse elements of the music could give the listener the transcendental feeling of the primordial spirit that could have spun the web of life — sonic life forms intermingling with one another in a continual ebb and flow, charged with chaotic but measured energy, coursing through the air much like the life blood coursing in us all.

A *Universe Symphony* indeed.

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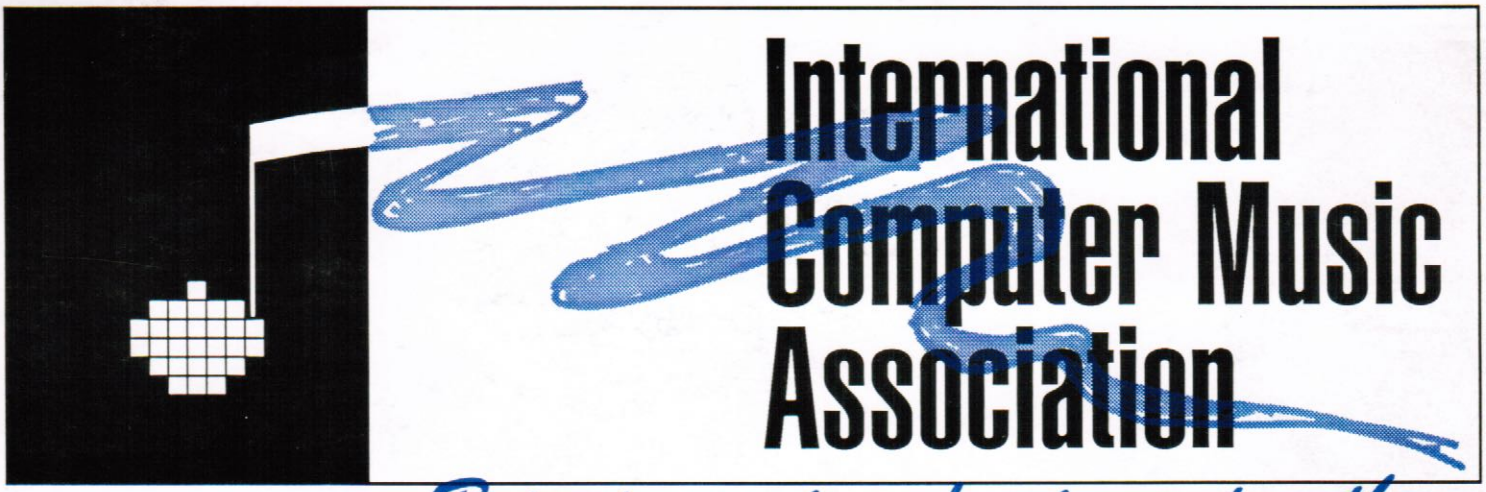

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