An enhanced version of the Accelerando Box has been completed and is now commercially available from White Instruments, Inc. The new model utilizes the 27MHz Motorola 56001 and can be equipped with stereo 18-bit A/D and quad 20-bit D/A converters and up to 4 MWords dynamic RAM. The Patchwork symbolic compiler, originally developed for the Apple Macintosh and IBM PC under Microsoft Windows, has now been ported to the Silicon Graphics Indigo under X-Windows, specifically as a front end to Csound.

1. THE ENHANCED ACCELERANDO BOX

New Hardware Design

The original Accelerando Box has been described in detail elsewhere, but it basically consisted of a 20MHz Motorola 56001 DSP, 32K of static RAM, MIDI in/out, a Yamaha Digital Cascade interface, and an IBM-compatible 8-bit bidirectional parallel port. It was designed to function as a real-time digital audio signal processor which was fully programmable and capable of being controlled either by MIDI or from a host computer via the parallel port. The main idea behind that design was to create a general-purpose DSP module which could be directly attached to an IBM PC and/or operate in stand-alone mode, as a conventional MIDI device. It could also be daught-chained with an unlimited number of similar modules using its MIDI and digital audio interfaces. The original box did not have Digital/Analog conversion hardware, but relied on Yamaha Digital Processors (e.g., DEQ7, DMP7, etc.) for analog input and output. Accelerando II incorporates many aspects of the old design, but it uses the 27MHz 56001 and abandons the Yamaha Digital Cascade in favor of the more widely-used AES/EBU digital audio interface. It also has Direct Digital I/O ports for daught-chaining multiple boxes and to provide direct access to the 56001's SRI and SCI ports. (With an appropriate adapter card, this would also allow the box to be connected to a NeXT computer via its DSP port.) The most important new feature of the Accelerando Box, however, is that it can now be equipped with up to 4 MWords of Dynamic RAM, as well as stereo 18-bit A/D and quad 20-bit D/A converters. The analog inputs/outputs use balanced, XLR connectors, there is 2K of EEROM for storing programs and parameter settings, and there is also an LCD display and programmable push-button editing controls on the front panel. The device is currently being manufactured and sold by White Instruments, Inc., of Austin, Texas, as part of their 5000-series of DSP devices.

New DSP Software

The MUSIC56000 synthesizer language has been revised to accommodate the new hardware and a number of enhancements have been made, especially in the area of MIDI support. All types of incoming MIDI messages are now accessible for use as realtime controls, and a set of MIDI processing and output units is planned. There are also several new macros which allow the user to take advantage of the LCD display and front panel controls, others which facilitate host communications via the parallel port. Audio rate calculations are now performed on an interrupt-driven basis, so that all other operations (including MIDI processing) can be handled in the main program loop, as a background task. Consequently, the box can be used for both audio and MIDI processing at the same time.
Several other extensions to MUSIC6000 are currently being developed, which take advantage of the large amount of dynamic RAM and quad D/A converters available on the new boxes. Specifically, masters are being written for sampling, loop editing, and playback, as well as for quadraphonic room simulation and the simulation of moving sounds. A set of standard studio effects and demonstration synthesizer designs are also being assembled, which will be included with the Accelerando Box when it is shipped.

New Host Software

The primary platform for the Accelerando host software continues to be the IBM PC, since the standard printer port can be used for high-speed digital audio transfers to/from the Box. In addition to the Win/View digital audio editor and the Patchwork symbolic compiler, which have been described elsewhere, a comprehensive loader and control program for the Accelerando Box has now been written, which also works under Microsoft Windows. The control program can communicate with the Box using either the parallel port or a Roland MPU401-compatible MIDI interface. It allows the user to load a DSP program to the Box, and then control it using a variety of graphical objects (a keyboard, slide faders, edit boxes, etc.). There is a template editor provided, so that custom edit/control panels can be designed to support any desired algorithm running on the Accelerando Box. These panels, along with different sets of parameters, can then be saved for future use. Finally, standard MIDI files can be played from disk, with the output directed to either the MIDI or parallel port or both.

A simple quad piano instrument in Patchwork, showing the use of MIDI continuous controllers and the front panel LCD of the Accelerando Box for VU meter.
Note that MIDI continuous controllers are converted to real values between -2.1 by the Accelerando MIDI tandler.
2. PATCHWORK ON THE IRIS INDIGO

Keith Lenti's Patchwork program, initially developed on the Apple Macintosh, then implemented on the IBM PC and the NeXT computer, has now been ported to X-Windows on the Silicon Graphics IRIS Indigo workstation, using OSF/Motif. X-Patchwork is optimized for use as a graphical front end to MIT's CSound, which is capable of running in real time on the Indigo. It includes a number of enhancements over previous versions of Patchwork, including multiple wopf types (for CSound's a, i, and k-variables names), multiple code lines per device icon, and several new compile options, including one which compiles the drawing, runs CSound with either MIDI input or a user-written test score, and then plays the output sound file, if one has been generated.

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4. REFERENCES