this particular law suit
story of "going after this
d they "get reelected by
s year after year," he

e arts center, the acquit-
sent a Pyrrhic victory at
rie says. The museum
· to shell out at least
in legal fees (more than
it of its budget), and all
· support (which pre-
ng in at about $110,000
has vanished.
lumbus, officials at the
Center for the Visual
e been nervous," says direc-
very uneasy," says direc-
rt Stearns, who was
redecessor at the CAC.
uld a conviction have af-
· role of museums as ed-
institutions?" he asks
te of alarm in his voice.
arns says the Cincinnati
will not influence pro-
ction at the Wexner, the
most important venue
-garde art, nor will it
t to cancel or alter any
rk featured at the cen-
e   he verdict] as a
o   : what we're do-
adas, mentioning that
roversial performance
en Finley is scheduled to
ere next month. "Our
· to present a diversity of
s."
says he thinks the ver-
dampen the spirits of
ple in other cities who
to prosecute art institu-
imilar charges. "If they
vin here with a sympa-
wer base and sympa-
enforcement officials,
re can they win?"
ther towns across the
re not unaware of anti-
efforts in Cincinnati.
ig women from Muske-
h., who were strolling
he Cincinnati Art Mu-
l the trial here has defi-
mpted citizens in Mus-
take action against
hey find obscene.
f the women, Diane
aid she grew up in Cin-
id was personally "sur-
the acquittal. Watching
lebrating over the ver-
· of tore at me. I wish we
ve seen a moral stand
iss Hoppes said.
e things like this trial
people want to get in-
d aware of what's going
l i'   " said her friend
hi
huppes: "A lot of
may not be some big
Mapplethorpe."

MUSIC TECHNOLOGY

Computers Gain a Musical Memory

A fast-growing technique stores sounds as information, then plays them back on special hardware

By Simson L. Garfinkel
Special to The Christian Science Monitor

NEW YORK

AT first, it sounds like a well-practiced choir chanting Italian church music. But if you listen closely, it begins to sound a little strange. The enunciation and the syllables are right, but the words are all wrong: There aren't any. One listener describes the singing as "random Italian."

Welcome to the voices of Henry Massalin.

"It sounds like a foreign language similar to some Italian," says Mr. Massalin, a doctoral candidate in computer science at Columbia University in New York City. The words are actually a combination of "Italian opera, Italian church chants, and a bit of Polish and other eastern European mixed in. ... It is an experiment, really, in how well a particular idea works."

That idea, says Massalin, is to represent the voices and syllables that make up a church chant as a stream of numbers. He then generates a new numeric stream that has the same statistical properties as the first but a different content. The result is something that sounds like Italian chanting to human ears, but lacks any identifiable words.

"I'm not a musician," he says. "Most of my work is in signal processing ... not musical concepts." Another one of his programs will automatically compose and play a rhythm accompaniment for a human soloist.

The work is largely unrelated to his research – designing high-speed computer operating systems for specialized applications. Nevertheless the music software is a lot of fun to work on, he says, and the music programs show the potential of the operating systems that he is developing.

To Massalin, music is data for his computer programs. But instead of treating the music as a series of digitized sounds – the way compact disc players work – Massalin's programs view music as a series of notes and intonations. To make sounds, he runs the data through specialized hardware.

The idea of storing music as information and then using special hardware to play it back is a powerful technique that is rapidly catching on in the music industry.

For the past few years, makers of music synthesizers have been equipping their top-of-the-line instruments with special devices that speak a language called MIDI (Musical Instrument Digital Interface). MIDI lets a musician easily connect a synthesizer with a home computer. The computer can then record music as it is played on the synthesizer's keyboard and play it back later, a kind of 21st-century player piano. On playback, the musician can change the tone of the music or even the instruments, making a piano solo sound like violins or flute.

"You can manipulate the performance," says Daniel Rose, a designer at Mark of the Unicorn, a Cambridge company that sells MIDI software. "On a gross level, [you can] correct any errors. On a wider level, if you are composing, you can try an infinite number of variations of the same idea, change pitch level, change

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>
> *– Daniel Rose*

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The MIDI language consists of a series of codes: one code makes the synthesizer turn on a certain musical voice at a given pitch. Another code turns off that voice. By sending a stream of these codes from the computer to a bank of synthesizers, Mark of the Unicorn's "Performer" program effectively becomes a computerized conductor for an electronic orchestra. According to Rose, up to 512 different musical voices can be controlled by a single computer at the same time.

"I actually saw a Philip Glass concert [played by] four Apple Macintoshes, each one running our software," he says.

Since MIDI codes can be stored on a regular floppy disk, some companies have started selling disks with the codes for popular songs. "They do Top-40 for cover bands," says Bob O'Donnell, editor of Electronic Musician magazine. Some bands use the MIDI just for backup – like adding a phantom drummer or keyboard player who knows the score perfectly – while other bands use the codes to achieve a larger repertoire than skill or memory might otherwise allow. Still another market is nightclub singers who want "good arrangements" of pop songs for backup.

A regular stereo system lets a listener change the tone and volume, but a computer and a MIDI-equipped synthesizer give the listener to-

tal control over the music. At the push of a button the tempo can be changed and individual instruments can be turned on and off. Because there is so much flexibility with the system, says O'Donnell, that song publishers and synthesizers manufactures have to decide on a standard set of codes for their instruments. For example, says O'Donnell, "you have to make sure that you have the trumpet patch on channel 32" and the other voices properly assigned, or else "you might have cymbals playing string parts."

In the future, he says, music publishers may even imbed MIDI codes on their compact discs, so that a listener could have a choice of hearing the Boston Pops' rendition of a piece of music or their own synthesizer's version. "It's very viable," says O'Donnell. "In fact, its happening. The mechanisms have been put into place." But while the plans have all be drawn up, no so-called "CD + MIDI" discs have been pressed yet, says O'Donnell.

For people who want their MIDI now, there is the compact-disc set of Mozart's "Magic Flute," released last year by Warner New Music in Burbank, Calif. Designed to be played with a Macintosh computer, a computerized CD player, and a synthesizer, the three-disc set contains "The Magic Flute" performed by the Chor des Opernhauses, Zurich, directed by Nikolaus Harnoncourt, the full libretti of the opera in English and German, more than 10,000 pages of explanatory notes, and the MIDI codes for the main character themes.

"A lot of teachers are using it in curriculums. It's a new way of getting people interested, ushering them into the music with computer technology," says Kimberly Sudhalter, a promotions coordinator for Warner New Music. As the opera plays, students can follow the libretto in German or English, or switch to a summary of the plot or even a summary of what is happening to the music itself. The students can even pull up "side bars" on the opera's symbolism, history, or Mozart's life.

JOHN MARTINI

HENRY MASSALIN: *To this computer scientist, music is data. But instead of treating music as digitized sounds – the way compact disc players work – his programs treat it as a series of notes and intonations.*