So roll over Beethoven, here come the kids . . .

In designing Hyperscore, Farbood and Pasztor have created a software tool that introduces children to musical composition in an intuitive and dynamic way, and which requires no previous music knowledge. The system interprets the gestures of a child's drawing, mapping them to structural elements in music. Using only a selection of colors and strokes, the child creates original musical motives, which are assigned to orchestral timbres, and then annotated along the piece's narrative, harmonic line, converting visual information into music.

Symphony Painter, which is targeted for children four years old and up, will be available to the public in late spring 2004, and will cost about $15. To help keep the price low, Farbood and Pasztor worked closely with Fisher-Price to redesign code for the Pixter platform. The first prototype took about a year to develop.

“The idea,” says Jeff Miller, manager of product design at Fisher-Price, “was to keep the essence of Hyperscore, but adapt it to a much simpler chip set, keeping the technology invisible so that the kids would never feel intimidated.”

David Ciganko, Fisher-Price's vice president for product development, sees Symphony Painter as the culmination of years of working closely with the Media Lab. Ciganko, who shares Machover's conviction that we can do a lot better than "canned" music for preschoolers, says he “convinced Tod that many of his team's ideas could easily work for very young children, and was a thorn in Tod's side to make this technology—starting with Hyperscore—available to them.”

“We both believe that igniting the spark of musical composition in very young children will have a wonderful impact on music,” says Machover. “The challenge came in figuring out how to do it. Hyperscore broke ground, and now Symphony Painter will make it widely accessible.”
Regardless of age, we’ve all had a “senior moment” of forgetfulness. It can be at a cocktail party, struggling to put a name to a familiar face, or at the doctor’s office, racking your brain for the name of the drug that had caused an allergic reaction.

We accept memory lapses as human fallibility, but what if researchers could find a way to use digital technology to cue our natural memory and help us overcome some of them? What if a simple computational aid could, for example, help an elderly person remember more, or provide critical cues for emergency medical technicians, doctors, or firefighters in a non-distracting way?

The implications of such memory aids are significant, says Media Lab graduate student Rich DeVaul, who is working with Toshiba Professor Alex (Sandy) Pentland in the Lab’s Human Design group to develop Memory Glasses, a wearable memory-aid for real-world settings.

Memory Glasses display “pop-up” subliminal cues operating below the wearer’s threshold of awareness. “In the real world, we’re never going to know exactly what people are trying to remember,” says DeVaul, “so we’re looking at ways to provide memory support in the least distracting way. We want to avoid the annoyance of adding stimuli to the wearer’s cognitive load unless we are certain the information is sufficiently important—and correct—to justify the conscious distraction of an overt cue.”

DeVaul admits that the idea of subliminal cuing first came about when Lab members joked about providing subliminal cues to sponsors, asking for more support. But after some preliminary research, the general idea proved to have enough merit to warrant serious consideration, and resulted in a joint study with Vicka Corey, a neuroscientist at the Harvard Medical School, to evaluate the success of a subliminal visual-cuing system.

For the study, 21 subjects were asked to match faces and names on a computer screen. The results proved promising: when provided with correct subliminal cues, the subjects’ performance improved by a factor of 1.5 over those who received no cues. “While we weren’t surprised by this positive effect of correct cuing, we were surprised to see that intentional miscuing didn’t have a negative impact,” says DeVaul. “This is important because the cues provided may often not match the user’s needs, and we don’t want miscues to cause confusion.”

Pentland and DeVaul emphasize that these are very preliminary findings, which need to be reproduced by other labs. “But I hope this work will be a good first step that provokes others to further investigation,” says DeVaul.

To learn more about the Lab’s work on wearables, and to download a copy of the Memory Glasses paper, visit http://www.media.mit.edu/wearables/
Breazeal Named to TR 100

Cynthia Breazeal, LG Career Development Professor and head of the Lab’s Robotic Life group, was selected by Technology Review as one of the 100 innovators aged 35 or younger whose technologies are poised to make a dramatic impact on our world. Breazeal was cited for constructing anthropomorphic robots that interact with people in a social way. Her latest robot, Leonardo, a collaborative effort with movie special-effects guru Stan Winston, is an endearing, furry creature who learns tasks from natural instruction, and is capable of following demonstrated actions. Leonardo can assess humans’ gestures, expressions, and speech, and respond in turn, demonstrating its own understanding.

Breazeal joins two other Media Lab faculty members in being named to the TR 100: Joseph Jacobson, head of the Lab’s Molecular Machines group, who was named to the magazine’s first listing in 1999, and Scott Manalis, head of the Lab’s Nanoscale Sensing group, who was honored in the second listing in 2002.

This year’s honorees also included four Lab alumni: Colin Bulthaup, Ravikanth Pappu, Joe Pompei, and Andrew Wheeler.

New Books

Biologically Inspired Intelligent Robots
Edited by Yoseph Bar-Cohen and Cynthia Breazeal
SPIE Press
2003

In this recent release from the International Society of Optical Engineering, LG Career Development Professor Cynthia Breazeal, head of the Lab’s Robotic Life group, and Yoseph Bar-Cohen, a research scientist at the Jet Propulsion Laboratory, explore the technical challenges and current trends in biomimetics. This anthology, which includes 11 papers, covers topics ranging from muscle-like actuators, to cognitive modeling for robots, to principles of animated expression and motion, giving the reader an in-depth look at what will be involved in finally building robots that look and behave like humans.

Me++: The Cyborg Self and the Networked City
William J. Mitchell
The MIT Press
2003

With Me++: The Cyborg Self and the Networked City, William Mitchell, head of the Lab’s academic program in Media Arts and Sciences and former dean of MIT’s School of Architecture and Planning, examines the changing role of information technology in our everyday lives. Here, Mitchell describes the transformation of wireless technology over the past century—from a world of Marconi’s “massive mechanism of tower and kerosene engine” to one of palm-sized cell phones. He explores how these changes, in turn, have redefined our relationship with our surroundings and each other.

And More Honors

Tod Machover received the first Ray Kurzweil Award of Technology in Music at the Telluride Tech Festival in August. The award recognized Machover’s pioneering research in music technology as well as his achievements as a composer and performer. In elaborating on the selection of Machover as the award’s first recipient, Kurzweil, in a holographic virtual presentation, described Machover as “the only person I am aware of who contributes on a world-class level to both the technology of music creation and to music itself. [His] contributions are remarkably diverse, and of exquisite quality.”

TR 100 award recipient LG Career Development Professor Cynthia Breazeal was also chosen as one of three finalists in the Communications Design category of the National Design Awards, given annually by the Smithsonian Institution’s Cooper-Hewitt, National Design Museum. Breazeal was recognized for her work on intelligent, lifelike, social, and affective robotic systems—work that explores the societal, philosophical, ethical, and interpersonal issues related to the latest technologies. Nominations for the awards come from more than 600 leading American architects, designers, educators, journalists, authors, and filmmakers.

The Human Design group, headed by Toshiba Professor Alex (Sandy) Pentland, received an award for “the most visionary technology” at the MIT Enterprise Forum of Cambridge’s 25th-anniversary event in November. The group’s work on Memory Glasses (see story in this issue), health-monitoring tools, and aids for group interaction, was cited for being “the coolest and most imaginative technology.”

Participants in Pentland’s digital entrepreneurship class, which is part of the Lab’s Digital Nations initiative, were named $1K winners in the Developmental/Social category of the MIT $50K Entrepreneurship Competition for their ScooterPower research project. This project focuses on turning a household’s method of transportation (typically a scooter or motorcycle) into a multi-purpose machine that can also perform useful tasks, such as powering electric lights or pumping water—providing an affordable source of power to many of the world’s one billion “mobile” poor.

NEC Career Development Professor Scott Manalis, head of the Lab’s Nanoscale Sensing group, was selected to participate in the National Academy of Engineering’s 2003 Frontiers of Engineering symposium, held in Irvine, California in September. The 2003 program focused on topics ranging from nanotechnology, to counterterrorism technologies, to biomolecular computing. The meeting, which has convened annually since 1995, provides an opportunity for some of the nation’s most promising young engineers to learn about cutting-edge developments in areas other than their own, facilitating collaborative initiatives and cross-field fertilization.
In November the Computer Clubhouse, co-founded by LEGO
Papert Associate Professor Mitchel Resnick, celebrated its
10th anniversary.

Over the past decade, the Clubhouse project has grown from
a single after-school center for teens in inner-city Boston to
a network of 87 Clubhouses worldwide. Today, Clubhouses
in 17 countries serve more than 20,000 youths from low-
income communities.

Clubhouse members, ages 10 to 18, learn to express them-
selves creatively with new technologies, creating their own
animations, video productions, robotic constructions, and
musical compositions. Resnick and his Lifelong Kindergar-
ten group at the Media Lab recently received grants from the
National Science Foundation and Intel Corporation, totaling
more than $2.5 million, to develop new software to be used
in the Clubhouses.

The Computer Clubhouse is a collaboration of the
Boston Museum of Science, Intel Corporation,
and the Media Lab.

For the Clubhouse anniversary party on
November 5, two Boston Clubhouse members,
Chris Cabrerra and Angel Ortiz, wrote and
performed a rap song:

The Computer Clubhouse is the place to be
Don't worry about fees 'cause the place is free
Like your mind when it sets sail
You can design a Web page or check your e-mail...
You can make new friends just chill and talk
Go in the studio, collaborate
Nobody has to hate
This place made it easier for me to graduate...

To hear a recording of the full performance,
visit http://www.computerclubhouse.org/
galleries/10year/flagshipanthem.mp3
That's the goal of Flogo, the Media Lab's newest programming language for kids, developed by recent graduate Chris Hancock. Flogo provides an easy and powerful way for kids to create video games and control robots—helping them more easily make connections between programming and their wider world.

Hancock, who studied with Mitchel Resnick, LEGO Papert Professor of Learning in the Lab's Lifelong Kindergarten group, designed Flogo to appeal to the way children like to learn. “Most programming languages require that you have some kind of theoretical knowledge before using them,” says Hancock, “but that's not the way humans tend to learn complicated things like language. The more natural inclination is to learn by tinkering, and therefore it's best to have a language that is ‘tinker-friendly.’

“My first goal was to make programming transparent and flexible. Then I reworked the language to end up with a live text version that shows the state of the programming right on the screen. When a certain line of code is active, it becomes brighter. This way, you can tell exactly what's happening.”

One of the more innovative features of Flogo is its departure from the long-accepted idea that you have a program “here” and computer memory sitting invisibly someplace else, giving the perception that it is somehow divorced from the program that it's acting on. With Flogo, you can add, edit, or browse through code, all while it continues to run, making it far more effective as a learning tool.

To give Flogo a “real-world” tryout, Hancock worked with students, ages 10 to 15, at an after-school program at the Milton Academy in Milton, Massachusetts. Receiving very little instruction, the students were given a choice of challenges, like making their robot follow a line, or finding a ball and pushing it off a table. The idea was to provide a programming language that kids can engage with physically and that is related to the world.

While Hancock notes that there's still lots more work to be done, Flogo is a next step in connecting programming to kids' worlds and kids' minds. And that connects strongly with how kids—or any of us—learn.

Sponsors may download a Media Lab PDF file of Hancock's thesis through insite, at https://www.media.mit.edu/insite/pubs/theses.php