COMPOSING TO A DIFFERENT DRUMMER

The research is real, not science fiction

BY SHARON PROCTOR | PORTRAITS BY MARK MUSHET

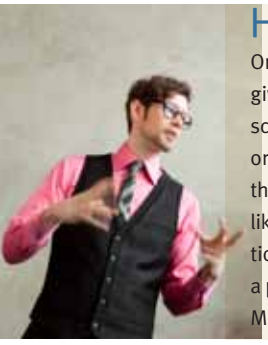
French-born Philippe Pasquier has been getting lucrative offers from industry (Google, for instance) ever since he received his PhD in artificial intelligence five years ago. And it's no wonder! He stands out in the high-tech crowd, for he's also a recognized composer, musician, performer, producer, artistic director, and educator. Four years ago he joined the faculty of the School of Interactive Arts and Technology at SFU Surrey, where he combines artificial intelligence with cognitive sciences research. He and his students are enabling computers to learn from experience and create on their own. It's a process called "metacreation" or "machine creativity."

If you've seen the 1968 movie *2001: A Space Odyssey*, you may remember HAL, the spaceship's built-in computer. Over time, HAL learned from the experiences of the astronauts, and then "he" stopped taking orders and took over the ship. But that's not the plan with Pasquier, who is interested in *artistic creativity*. His goal is to help creative people become even more creative—not to replace them with computers. His particular focus is musical creativity, and he and his students are being assisted by composers, dancers, musicians, video game makers, and other artists.

Creative software for composers

A music composer can spend hours, days, weeks, or even months articulating a single composition within a software application. It's very time consuming. Now imagine a keyboard containing software that "learns" from the composer as he or she tinkers with the keys. And imagine the software eventually figuring out on its own what the composer is trying to achieve, and then completing the task. Pasquier's MAMAS lab has been developing software aimed at helping composers quickly produce new compositions in various musical styles. (MAMAS = metacreation, agents, and multiagent systems.) "I can enter some scores by J.S. Bach, for instance into the computer," he explains. "Then, when I ask it to generate eight new bars of music in that same style, it does so."

Pasquier's group also is developing software for sound designers (video games, films, and video documentaries) to help them effectively navigate the huge libraries of 100,000 or more sounds at their disposal. Have you ever done a Google search for something you can't precisely name? You have to use your intuition to find it. The new software will enable sound designers to use intuition and educated guesses in the same way to find what they want in sound banks.



How creative music software works

One popular family of programs (algorithms) that can be used to generate music in a given style is called a Markov chain. The basic idea is this: The computer reads some scores (the "corpus") given as input, and it memorizes the transitions between chords or notes. When asked to generate new content, it selects a starting chord or note and then looks at the possible continuations from the corpus. The system chooses the most likely transition to capture the canon (rules) of the learned style – or a less likely transition to generate more surprising original content. In other words, composing music in a particular style involves copying and pasting transitions. To compose in the style of Mozart, for instance, you would use the transitions he used and in the same proportions.

Why focus on composers? Because video games have become a multi-billion dollar industry, and their producers are experiencing a growing need for original music. But composing for a game is more complicated and time consuming than composing for a movie soundtrack. For example, when John Williams composed the music for the *Star Wars* sequel *The Empire Strikes Back,* he created two hours of original music in eight weeks' time. Thirty-five years ago that was an amazing feat. Today's video game producer, however, can require 200 hours of new music every week!

Future games will take a player along an increasing number of alternative pathways, depending on the player's choices, so each pathway will need its own characteristic music. Not only that, but games will have music that reflects the player's emotions at the time, whether he or she wins or loses, or is happy or sad. According to Pasquier, "If game producers want diversity of music, as well as music that adapts to a player's choices and experiences, their composers will need creative software like ours."

Other music-related projects

In addition to developing software for use by composers, Pasquier has been involved in the design of a wide variety of other music-related applications in Canada and Europe. Unfortunately, there is room to describe only a small sample here.

First, there's the improvisation software his lab is developing. When many of us think of musical improvisation, we think of jazz artists like Duke Ellington. But other musicians improvise, too. That is, they create a new melody, or variation of a melody, in response to what other musicians are playing at the time. The SFU team has constructed an autonomous machine (one that works on its own) that can improvise along with one or more performing human musicians. It hears and analyzes the sounds of the players, then immediately composes and performs in response.

Dancers, too, are benefiting from Pasquier's talents. One Montreal group developed body movements that combine contemporary dance (think Isadora Duncan) with street dancing. Street (or "urban") dancing, as you may know, requires the dancer's whole body to interact with the floor. The merging of these two styles, combined with interactive sound and lighting, creates a visual effect reminiscent of Pablo Picasso's paintings of the human body in various positions. "I conceived a new type of contact sensor for the dancers," explains Pasquier. "It consists of a six-metre-wide circular carpet with a circuit and sensors inside, and special software. The dancers dance on it, meanwhile comfortably interacting with sound and lights via the carpet."

A while back, Pasquier undertook a couple of interesting assignments in France. In one he helped create a "wall of sound." It consists of a wall of speakers that disperse the music produced by a network of synthesizers. "Each speaker broadcasts the sounds of a single synthesizer," he explains, "and the various synthesizers are linked to make different parts of the wall interact with each other. This creates an intriguing spatial effect for the audience." Another project was for a three-week exhibition. He helped develop a quadraphonic sound system (four recording channels) for escalators in a shopping mall. As shoppers moved up and down the escalators, they passed through various sounds that were also moving up and down.

Life before SFU

"I was a geek as a boy," he explains. "I had my first computer at age 10 or 11, and had mastered computer programming by age 13. The movies *Star Wars* and *Tron* fascinated me." His family was a strong influence. "My father is an engineer, and my grandfather and several uncles and aunts were professors. We moved around a lot, as my father travelled to construction sites in various countries. I had a lot of exposure to other cultures and situations."

When it came to his education, his parents were adamant he study science. "They wouldn't let me pursue anything else. So I majored in engineering at university and eventually got involved in artificial intelligence and machine learning."

With all the industry offers he's had, what made him choose to be an SFU professor? "I love pure research that leads to new knowledge. Only universities offer that. As for SFU, it's a top-ranked university and Canada is as close to paradise as any place on Earth."

And if he'd not gone into computer engineering? "I would have been a full-time artist, if only I were brave enough." **aq**