The Edge of NIME - from Cult to Conference

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Music and technology are at the intersection of fundamental drives within the human race – curiosity, the need to innovate, and the urge to express. As such, the development of musical instruments has drawn an enormous amount of talent and dedication. Once people exploit a new technology for food, shelter, or defense, they rapidly move on to using it for less immediately "practical" applications that are nonetheless vital to them, such as performing music. Or perhaps this works in reverse – a relatively recent example is the way in which spread-spectrum communication, secretly developed by the allies in World War II, was partially inspired by the design of the player piano.

Each set of technologies has ushered in its own set of revolutions in the way people generate and interact with music. Very shortly after mankind harnessed the electron in the 1800's to ease his toil through use of motors and extend his reach with the telegraph, people began playing with what became electronic music. Acoustic musical instruments have settled into canonical forms, taking centuries, if not millennia, to evolve their balance between sound production, ergonomics, playability, potential for expression, and aesthetic design. In contrast, electronic instruments have been around for only little more than the last century, during which rapid advances in technology have continually opened new possibilities for sound synthesis and control, keeping the field in rapid revolution.

As electronic music instruments liberate the action of musical control from the sound production mechanisms, their form doesn't need to be limited by the corresponding constraints and is free to move in many other directions. Although bound by the capabilities of available analog and vacuum tube or dynamo-based technologies, the very early pioneers of electronic music embraced this vision, and were highly motivated to explore extra and unusual channels of articulation and control for achieving an expressive performance. Perhaps this was because the electronic instruments were then in such an obvious contrast with their highly-expressive acoustic contemporary cohorts. Looking at the first electronic music instruments, one notes that nearly all of them were controlled by interfaces that were nonstandard in one way or another. We see this in the position-sensitive, just-intonation keyboard and timbre controllers of the Telharmonium, the radical free-gesture Theremin interface, the movable keyboard, knee pedal, and timbre stops on the Ondes-Martenot, and the wonderfully expressive left-hand controller and multimodal keyboard of the Electronic Sackbut. As electronic instruments became commodity, from the Hammond Organ through the Moog Synthesizers, alternative controllers became sidelined, and the market was dominated by the diatonic organ manual, perhaps with the addition of a couple of wheels and a pedal or two. This began to change in the age of MIDI, which enabled an even cleaner separation with a mere serial cable connecting control and synthesis and a set of standards that ushered in expressive keyboards as commodity. MIDI also launched a fledgling "alternative controllers" market, and although monthly columns along this theme began appearing in the commercial music press, no alternative controller has yet risen to significantly rival their canonical counterparts in the marketplace.

There are many indications that this is changing. The ubiquity of cheap and powerful personal computers have made them a common part of any electronic music studio. A PC or Mac is now usually inserted between MIDI controller and synthesizer, allowing complex mapping functions to interpret musical gesture in very sophisticated ways. Inserting a computer into the path between the musical controller and synthesizer enables any kind of gesture to be software mapped onto essentially any musical response, from the most delicate and intimate control of a virtuoso playing a fine instrument to the limited, high-level direction of a child stomping through an interactive installation. On the hardware front, today's sensor technologies enable virtually any kind of physical expression to be detected and tracked. Sensors to measure all kinds of parameters are readily available, and with only limited knowledge of hardware, one can now set off to build an alternative controller. Several inexpensive analog interface boxes are now manufactured, granting the computer direct access to these sensor values, and simply-mastered musical mapping software packages allow a user to produce a set of programmable parameters that can direct and continuously sculpt the detailed nuances of essentially any sound.

In addition, although there are still important innovations coming from the music synthesis community, computer-based sound generation is now a fairly mature technology. Newer synthesis techniques, such as physical modeling, actually tend to require additional or continuously sculpted channels of articulation in order to achieve their full potential for the generation of expressive sound. The musical research community has realized this, and an increasing amount of institutional and corporate research in this area has been devoted to the control, rather than synthesis, of music.

These factors have led to an explosion in the quantity and variety of electronic music interfaces that are being developed. Yet the field is still in its infancy – al-

though there's an amazing amount of innovation devoted to this area, we don't yet have any idea which directions will eventually succeed and lead to the Stradivarius's of tomorrow. One wonders whether the forms of future musical controllers will ever settle and finally supplant the centuries-old keyboard, string, percussion, and wind form factors that still dominate the commercial landscape. Over the course of my own career, I've developed several alternate musical controllers – although it's always fun to play with them, when I want an intimate musical experience, I confess that I usually prefer my MiniMoog and a good electric piano.

The vocabulary in this field is likewise in its infancy – there's still no common set of standards with which to evaluate designs, and as goals are so varied in different applications, its unclear whether this can ever be effectively accomplished. Indeed, the practitioners in this field spring from many walks of life – academic researchers, musical performers and composers, dancers and choreographers, artistic designers, video game developers, interactive and media installation artists, teachers (from university to grammar school), and therapists (special needs, exercise, and relaxation), to name a few. It's certainly exciting to have so many perspectives under one umbrella, although such a broad convergence may be a temporary phenomenon. A major question is whether this field is becoming so broad that it will fragment into subgenera with different goals and motivations, or are there deep principles in common that can be applied throughout? Conversely, even though they have some aspects (and several researchers) in common, one can ask how deep a union research in musical controllers will be able to forge with the larger field of Human-Computer Interfaces. Although aesthetic design can influence both endeavors, this emphasis is far greater with musical instruments. Today's performer (or perhaps performance artist) is often a modern shaman, dazzling the audience with an armada of technology and instruments that want to look interesting and provide some degree of spectacle, from glittering electric guitars and massive modular synthesizers to laser harps and necktie-keyboards.

An exciting aspect of this field is its unpredictability, as new technical capability rapidly revolutionizes the way we generate and interact with music. The computer that's now between the controller and synthesizer engine will certainly become more sophisticated, and advances in perception and machine intelligence will enable it to become more of a partner than a crutch. Perhaps instruments will adapt to the player, customizing to their nuance and style. Such an intelligent controller would limit the options for an amateur (still sounding good and being satisfying to play) while allowing more expression as the player becomes progressively adept. As we move towards a future of smart objects and ubiquitous computing, most devices will be overdetermined with many sensors that produce a multitude of parameters available to any application, allowing almost any artifact, environment, or event to produce music. Indeed, will the musical instruments of the future be even recognizable as such to people living today?

Early in the past century, electric motors represented forefront technology, and it was rare to have several in a home. Now, with modern fabrication techniques and new materials, motors are commonplace, with myriads embedded in everything from home stereos to microwave ovens (computers have recently followed a similar trajectory). As actuators continue their advance into our environment, the introduction of programmable haptic response into musical controllers becomes very feasible, allowing the feel of a musical interface to become dynamic and opening up a new perceptive channel in the musical union of man and machine.

Advances in bioinstrumentation promise new interfaces that can bring this concept further and revolutionize what we think of as a musical interface. Already for several decades, people have been exploring the use of biological signals (e.g., EMG's, heart rate, skin resistance, brain waves, etc.) to control music. At the moment, such noninvasive measurements tend to be quite coarse, but once direct neural/electrical connections are perfected (as are now being pursued for application in aural/ocular/muscular prosthetics), this situation may flip and direct bioelectrical musical interfaces could prove to enable a much more deft and intimate musical interaction than their clunky mechanical forebears. Indeed, it is commonly believed that the world will be most radically changed by the impact of biotechnology. Looking at music, perhaps a catchy tune or infectious melody will gain more literal ramifications…

Fanfare aside, we are delighted to welcome you to the world's first international conference on musical interfaces. In prior years, the musical interface community has been a small "bump" attached to larger gatherings associated with broader application domains (e.g., the working group on new interfaces at the ICMC, last year's NIME workshop at ACM SIGCHI 2001, various participation at ACM SIGGRAPH and IEEE Multimedia, etc.). The field has grown sufficiently to now justify its own full conference, and we're happy to host its debut at our Media Lab Europe in Dublin. We look forward to a very stimulating event, with state-of-the-art papers, demonstrations, and performances presented from many application perspectives and different corners of the globe. Although the field is yet a fledgling, it is growing quickly – we look forward to seeing all of you and many new friends (with even more interesting interfaces) at NIME2003 in Montreal and beyond.