New Interfaces for Musical Expression

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Topic: The impact of interface technology on all aspects of musical expression.

The rapid evolution of electronics, digital media, advanced materials, and other areas of technology, is opening up unprecedented opportunities for musical interface inventors and designers. The possibilities afforded by these new technologies carry with them the challenges of a complex and often confusing array of choices for musical composers and performers. New musical technologies are at least partly responsible for the current explosion of new musical forms, some of which are controversial and challenge traditional definitions of music. Alternative musical controllers, currently the leading edge of the ongoing dialogue between technology and musical culture, involve many of the issues covered at past CHI meetings.

GOALS

To bring together interface experts interested in musical controllers and musicians and composers involved in the development of new musical interfaces, especially alternative controllers, to stimulate exchange with the following aims:

(1) To survey and discuss the current state of control interfaces for musical performance, identify current and promising directions of research and unsolved problems. To focus on the major practical concerns involved in the design of interfaces for musical expression.

(2) To identify major issues involved the interplay between technological change and changes in musical forms.

(3) To identify the ways in which alternate controllers affect the overall creative process from composition to performance and determine what impact this has on musical expression.

(4) To put together the collective working experience and wisdom of the participants in some tangible form, such as strategies for success and a list of the 10 most difficult problems in musical controls.

DETAILED DESCRIPTION OF TOPIC

Music has historically been a meeting point for technology and artistic expression. The design of musical instruments may well have been the first area of technology where careful and systematic interface design played an essential if not the central role. While music has always been a driving force for technological innovation, it is also true that new technologies have opened the way for new forms of musical expression and experimentation. To give a familiar example, the modern piano, and consequently the classical piano repertoire, such as Beethoven concertos, would not be possible without the great improvements in metallurgy at the turn of the 18th century. This allowed the construction of one-piece cast-iron frames that could support the 18-ton string tensions exerted by performers (Saches, 1940).

In the current era, new technologies that can benefit musical expression are appearing at an accelerating pace. The last century, especially in the 1950's and 60's, saw the rise of electronic musical sound synthesis which gave birth to a plethora of new musical forms in both popular and classical or "serious" arenas of electronic music. We can expect that the continuing progress in information technologies will stimulate composers and musicians to experiment with new means of composition and new instruments for performance.

The development of novel sensor interfaces, vision and pattern recognition, virtual and augmented reality, haptic feedback devices and the like are all opening up avenues for new musical adventurers. The field of alternative musical controllers is at a stage somewhat similar to where electronic synthesis was in the 1950's. The basic paradigms are still being explored and there is an explosion of new interfaces, with, so far, little systematic thought about where the field is headed. Because alternative controllers are essentially means of mapping human behavior into musical expression, issues dealt with by interface designers could be very helpful in understanding and clarifying the state of the field.

GENERAL ISSUES

Each participant should include in their position statement a summary of their stance on all or some of the following general issues.

(1) The explosion of methods for generating, sequencing, layering and controlling sounds offers a complex and often confusing range of choices to musical explorers. The limits of music are being pushed, and many in the audience ask: is this music? In the context of new interfaces for human musical expression, fundamental questions are raised: what is a composition; what is a musical instrument? In the case of a machine assisted composition or performance are we still listening to music? How do interface issues bear upon these age-old fundamental questions about art and aesthetics in the context of music?

(2) The rapid pace of change of the new technologies used to build new controllers is double edged: there is a growth of exciting new controllers - however these controllers risk becoming technologically obsolete very quickly. Will establishing standards help or hinder musical interface evolution? The MIDI standard is a case in point - though it has become a wide spread standard in electronic music, there is nonetheless controversy about whether its influence is overall positive or negative.

(3) Alternative controllers bring new freedom to musical expression in that the mapping between action and sound-generation can be arbitrarily changed. However, relatively few mappings are intuitive and natural, many do not make use of our physical intuition and are difficult to learn and use. It is therefore important to discuss what features of mappings constitute appropriate musical interface design.

PRACTICAL MATTERS

While part of the workshop will aim to stimulate basic inquiry into the impact of interface technology on musical culture, the main body of the workshop will be devoted to a dialogue amongst the participants on the practical matter of how to design good musical interfaces.

(1) To identify criteria for evaluating musical interfaces. We will discuss the relative merits of

- usability and comprehensibility
- expressiveness
- sensitivity and sophistication
- aesthetics
- hedonics ("does it feel good?")

and other criteria. The aim is to clarify what guidelines are needed to develop interfaces that are worthy of the dedication and practice needed in acquiring skill with a new instrument.

(2) Identify key interface technology developments that offer the most exciting new opportunities for musical expression. For example

- touch sensors
- position, orientation, and motion sensors
- pressure and strain sensors
- gloves and suits
- computer vision and pattern recognition
- tactile feedback

How is sensor input best mapped onto musical sound? Are certain modes of human behavior and motion more suitable for musical expression than others?

(3) To discuss the role of cognitive science and psychology in the design of musical interfaces. What are the factors determining whether an interface is suitable for the creative expression of complex ideas and emotion patterns?

(4) To share collective experience. Each participant should include in their position their experience on designing musical alternative controllers, their advantages and disadvantages in musical performance. Distilling these reports, the group will try to suggest effective design patterns or guidelines.

FORMAT & ORGANIZATION

The workshop will consist of a day-long highly interactive format which will encourage open dialogue and sharing between each of 12-15 participants. The overall goals are to clarify issues of general and practical importance, share collective wisdom, and document of the outcome of the workshop discussion.

Participant solicitation/selection

As the topic of the workshop is intrinsically multidisciplinary, we will solicit position statements from both the computer human interface and computer and electronic music communities. Participants will be selected on the basis of their experience, past contributions to the field and their position statements. We will also aim to achieve a balance of viewpoints and backgrounds at the workshop.

Desired Number of Participants

12-15 participants will be selected to participate in the workshop

Schedule

1st hour: Introduction: opening of the workshop, extended self-introductions (5 minutes each), including research interests in musical interfaces and expectation from the workshop.

2nd and 3 hour: Presentations from 12 participants, each will have 15 minutes for the presentation, which includes discussion.

Break: continue discussion, showing videos and music

4th hours: continue presentation from participants
5th: round table, all participants will be asked the same 4 questions prepared in advance by organizers along the lines outlined in the goal and topic of this proposal, to collect views and opinions

6th hour: Review and distill shared information, try to find areas of agreement regarding what constitutes “good” and “bad” designs for different kinds of controller technologies. Formulate workshop statement to outline discussed issues for publication.

After workshop activities: JAM

Pre-workshop Activities

We will ask to each participant to reflect on their own musical interface design and/or use experience and prepare a position statement according to the suggestions given above. Position statements will be collated and dis-

tributed to all participants so that they can prepare for the discussion. A web site with workshop materials and information will be set up.

Post-workshop Event:
We would like to organize a post-workshop event at Experience Music Project in order to continue the day's discussion in a more informal format. We would be grateful for assistance from the CHI local organizing committee in establishing contact with the EMP management. As two of the workshop organizers work at a research lab that is funded by the major Japanese high-tech concerns, it may be possible for us to obtain some corporate financial support for this post-workshop event.

Plan to Disseminate Results
Results of the workshop will be presented as a full workshop report for the SIGCHI Bulletin. We will also submit reports on the workshop to the Computer Music Journal (MIT Press) and the magazine Electronic Musician. Summaries of the position statements and discussion outcomes will be posted on a web site. We will also organize a special issue of a journal. Full-length versions of selected position statements will be invited for the submission.

Fees
Fees will be waived for Sid Fels and Tina Blaine (Bean).

Technical Requirements:
No unusual technical support beyond the conventional AV equipment (a monitor and VCR), data projector and PC computer to show presentations, will be necessary.

ORGANIZERS BACKGROUND INFORMATION

Ivan Poupyrev
Ivan Poupyrev is a Researcher at Interaction Laboratory, Sony Computer Science Labs. He has been doing research on advanced controllers for user interfaces for last six years including interfaces and controllers for modern electronic music: his electronic music controller the Augmented Groove was demonstrated at the SIGGRAPH 2000. This and other results of his work have been presented in numerous conferences and journals such as UIST, CHI, SIGGRAPH, EUROGRAPHICS and others.

Michael J. Lyons
Michael J. Lyons has worked in the field of face and gesture controlled interfaces since 1995 when he founded a project at the USC Annenberg Center for Communication to build a facial-gesture controlled computer interface. He is the inventor of the Piehole and Mouthsynth interfaces that convert facial action to MIDI, as well as the Egaokun system, which uses automatic facial recognition to generate personalized cyberspace Avatars. He has published numerous articles in the field of face and gesture recognition.

Sidney Fels
Sid Fels is an assistant professor in the department of Electrical and Computer Engineering at the University of British Columbia. He has over 10 years of experience in creating alternative controllers for speech and music with numerous publications documenting his work. He created the Iamascope that uses video input for graphic and music control. He also created Glove-TalkII: a gesture-based speech controller that works like a vocally based musical instrument. Other works include: MusiKalscope, Video Cubism, Sound Sculpting and the Forklift Ballet. While at Virtual Technologies in Palo Alto, he built a commercial gesture recognition system called GesturePlus. His current research focuses on understanding the role of intimacy and embodiment in building instruments that support human expression. He participated in the gesture workshop during CHI95 as well as other non-CHI workshops, but this is his first attempt at organizing a CHI workshop.

Tina Blaine (Bean)
Tina Blaine (Bean) is an adjunct faculty member at Carnegie Mellon University's Entertainment Technology Center, exploring new interface designs for collective music making. As a musical interactivist at Interval Research, she led a development team in the creation of a collaborative audiovisual instrument known as the Jam-O-Drum. The Jam-O-Drum Interactive Music System is an installation at the Experience Music Project and was also featured at Siggraph and DIS 2000 ACM conferences. Tina spent 12 years with the multimedia ensemble D'CuCKOO, building and designing electronic MIDI controller instruments for performance and audience participation. She has also been a guest artist, performer, and speaker about interactive musical media and writes about new technologies and alternative controller devices for various magazines, including Electronic Musician. In her other life, Tina performs and teaches with the world music percussion ensemble, RhythMix.

REFERENCES

"Iamascope: a graphical musical instrument" Fels, S., Mase, K., Computer & Graphics, 1999. 23: pp. 277-286.

" Augmented Groove: Collaborative Jamming in Augmented Reality." Poupyrev, I., Berry, R., Kurumisawa, J., Nakao, *et al.*, Proceedings of SIGGRAPH'2000 Conference Abstracts and Applications. 2000. ACM. pp. 77.

Trends in Gestural Control of Music. Edited by Wanderly, M. & Baffier, M. IRCAM CD-ROM

"The Outer Limits: A Survey of Unconventional Musical Input Devices" M. Cutler, G. Robair & Bean, Electronic Musician, August 2000, pp. 50 - 72

Sachs, C., *The history of musical instruments*. 1940, New York: Norton. pp. .