

A Letter from Greg Kramer: founder of ICAD

Thomas and Andy have asked me to write something that can be read at the Interactive Sonification workshop that they have put together. I appreciate the invitation; thank you, Thomas and Andy.

First, a personal statement. I would love to be there and since I was invited and even offered support for the trip, I have only my own decision to blame for not attending. I have been travelling non-stop for half a year and have set aside this time to write. This feels like the right decision, but a big part of me wants to meet all of you, hear about your work, and see where this workshop leads. Post-workshop reports are a far cry from the real deal. But perhaps I'll meet some of you later this year at ICAD in Sydney or in 2005, wherever ICAD ends up that year.

Despite the breadth of ICAD, sonification is the topic that interests me the most. The perceptual issues, applications, and even the tool development required to engage in sonification research are all at the edge of their respective fields. There is so much we don't know about how we perceive and make sense of complex sound. We don't know how multiple auditory variables interact and, indeed, we don't even know if there is such a thing as orthogonality when it comes to complex auditory variables. If pitch and loudness interact as much as they do, what can we expect from brightness, roughness, density, sharpness, or whatever sound attributes we find ourselves working with? Good but primitive work has been done as to how we parse a complex sound field into streams. Researchers in this area have joined their other auditory perception brethren and wisely, I think, left the more complex matter of timbre largely out of the mix. As we address the question of how to talk about timbre and its role in streaming, it seems to me that sonification, with its focus on discreet timbral variables, will have something of value to contribute to this inquiry. Likewise, we have no comprehensive approach as to how to synthesize and manipulate complex sounds such that perceptually meaningful control is afforded the sonification designer. Again, good work is being done, but we are at the earliest stages of that research.

And with scattered researchers trying to identify applications whose task demands fit well with the strengths of sonification, it is clear we have quite a way to go before we can stop saying things like:

"You want to know about my research? "

"What do I do? Well, it's like graphs in sound."

or,

"Well, it's like Geiger counters, but on steroids"

The response is still, "What?!", and who can blame the poor questioner.

Meanwhile, sonification seems a lot like a solution in search of a problem. Perhaps the problem domains could be based upon strengths in fundamental auditory perception and strengths in higher level auditory and cognitive processing. For example, there is the acute temporal resolution of the auditory channel and our associated capacity to perceive temporal patterns. Likewise, there is the ability to simultaneously perceive multiple streams and/or auditory variables and the associated capacity to form complex auditory gestalts. All of these perceptual and cognitive capacities point towards display designs that, if applied to the right problem, would yield the kind of breakthrough that would provide the practical validation most valued by the marketplace, funders, and academic departments.

In the absence of this validation, we (all of us, I think) proceed based upon an interest in the problems for their own sake, an intuition that they will yield clear scientific value and tangible applications, and out of the sheer love of sound. These things interest and challenge me and, I would guess, they interest you. I suspect you wouldn't be involved in this research if you were not at least somewhat comfortable working at the edge.

But there is another connection here that this workshop brings into sharp and exquisite focus: sonification and music. The focus on interactive sonification reveals the closeness and even overlap of this research with real-time musical performance, my first discipline and still a region of heartfelt engagement. As a musician, when I manipulate a synthesized sound, I am free to follow where it leads. Intellectual interest, emotional impact, technological prowess, or simple sensual fascination are all valid motivators for my musical inquiry. In sonification, this is not enough. I am also called to incline the work towards a pragmatic result: can the listener - me or anyone else - actually learn something meaningful about the field of research from which the data is drawn? That is, is the sonification useful? Still, in both music and interactive sonification, I am interacting with the sound with the highest degree of moment-to-moment control that is afforded me, and in both disciplines any success will depend in large part upon my mastery of the territory.

One way of looking at this might be as follows: In interactive sonification I begin by conceiving of my task as traversing and exploring the data domain, and the hardware by which I traverse and explore is my handle into this data domain. In music, I am focused first on the sound field itself, traversing, exploring, or even manipulating a sonic territory on its own terms. But if you watched me work, at any given moment it may not be clear from the outside which task I am engaged in, that is, whether the data domain or the sound domain itself is of primary interest. Herein lie some enticing questions about intention, aesthetics, creativity, and the shape of science.

While I can't address these questions in depth here, one thing is clear. Real-time interaction is an important pivot point of artistic creativity and scientific discovery. The elements of play and interplay open the doors to creativity. Rather than manipulation of the known, one enters into an intuitive exploration of the unknown. One's attention is fully absorbed in the present experience, and in that unfolding moment the source of scientific or artistic inspiration extends beyond the analytical and even beyond the cognitive.

I won't run on about this; I suspect many of you are already considering these ideas. This letter is just an introductory statement, one that I am making by virtue of the privilege afforded me because of my work in the past. And even if I did delve into these questions, I don't think I occupy such a position of privilege that my answers would be particularly brilliant. But perhaps I can invite you to consider these questions, along with all of the other elements on the workshop agenda. Perhaps it is sufficient to say that I think that you folks are inquiring into an area rich with possibility. As we say in English, you are barking up the right tree.

And I, too, am still barking. I'll tell you about a prominent tree in this Greg-forest because I think it highlights this music/interactive sonification edge.

A major effort of mine right now is to complete the construction of a musical instrument that Bob Moog and I began to design some twenty years ago. This is a piano keyboard wherein each of the 88 keys has been fitted with an independent multi-dimensional controller. In addition to note selection, every key also senses finger position (giving X and Y outputs), up-down position (Z), force (aftertouch, in MIDI language), and finger area covered. Derived values such as velocity of Z, averages, and so on, of course, will also be provided. After all of these years of endless delays, Moog has just delivered the keyboard itself (which fits into an electro-acoustic grand piano). Hardware interfacing and very significant control signal processing software is in progress. Creation or assembly of the sound synthesis software has not yet been initiated; for this I seek collaborators.

This multi-dimensional controller project played a significant role in the development of my thinking that led to my personal sonification epiphany. That is, I conceived of the development of the sonic part of this instrument largely in terms of the basic problem of "What do I do with all this data?" Now the tasks before me are clearly at that fertile edge where all of you are working. The synthesis systems must be constructed and I am asking, "What synthesis and control paradigms, what algorithms, will provide meaningful control over sound from a highly multi-dimensional control source?" Replace the words "control source" with "data source", and, voila, we move seamlessly between art and science. Indeed, my internal auditory images that have served as an inspiration for my high dimensional sonifications came not from the meager history of auditory data representation but from the work of Xenakis (especially Bohor I) and my own music compositions. I must admit, however, that the search for orthogonal display dimensions and workable displays led to results that fell far short of this vision.

So let me close this speech-at-a-distance and say that I support the work you are doing at this workshop. I think it is important and look forward to seeing and hearing the results and meeting many of you, at ICAD or wherever our paths cross. It is not always easy to take on the constraints of methodical research, especially when just exploring these new territories is so exciting, but with interactive sonification you are tacitly agreeing to do just this. Without methodical research, science and even commerce will afford your work little credibility and relegate it, however interesting, to the backwaters of pseudo-science. Likewise, it is not at all trivial to infuse the scientific endeavor with the vigor of creativity and inventiveness, and there is no way you can approach this task with those qualities. I would guess there will be a lot of rich and very alive interchanges at this workshop. Above all, I hope you have fun, enjoy and support each other in your work, and move the field forward in significant ways.

See you in Sydney in July.

Greg