Key Note Address: Interconnected Musical Networks – Bringing Expression and Thoughtfulness to Collaborative Group Playing

Gil Weinberg

MIT Media Laboratory, E15-491, Cambridge, Massachusetts 02139-4309 USA
email: gili@media.mit.edu

Abstract

Music today is more ubiquitous, accessible, and democratized than ever. Thanks to technologies such as high-end home studios, audio compression, and digital distribution, music now surrounds us in everyday life - almost every piece of music is a few minutes of download away and almost any western musician, novice or expert, can compose, perform and distribute their music directly to their listeners from their home studios.

But at the same time these technologies lead to some concerning social effects on the culture of consuming and creating music. Although music is available for more people, in more locations, and for longer periods of time, most listeners experience it in an incidental, unengaged, or utilitarian manner. On the creation side, home studios promote privet and isolated practice of music making where hardly any musical instruments or even musicians are needed, and where the value of live group interaction is marginal.

In my work I attempt to use technology to address these same concerning effects that it had created by developing tools and applications that would address two main challenges:

Figure 1. The Beatbugs concert in Dublin

1. Facilitating engaged and thoughtful as well as intuitive and expressive musical experiences for novices and children.

2. Enhancing the inherent social attributes of music making by connecting to and intensifying the roots of music as a collaborative group ritual.

Figure 2. The Squeezables

My approach for addressing the first challenge is to study and model music cognition and education theories and to design algorithms that would bridge between the thoughtful and the expressive, allowing novices and children an access to meaningful and engaging musical experiences. In order to addressee the latter challenge I have decided to employ the digital network – a promising candidate for bringing a unique added value to the musical experience of collaborative group playing. I have chosen to address both challenges by embedding cognitive and educational concepts in newly designed interconnect instruments and applications, which led to the development of a number of such Interconnected Musical Networks (IMNs) – live performance systems that allow players to influence, share, and shape each other's music in real-time.

In my talk I discuss the concepts, motivations, and aesthetics behind IMNs, review a number of historical and technological landmarks that led the way to the development of the field, and present a set of networks that I have developed in an effort to turn IMNs into an expressive and intuitive art form which provide meaningful learning experiences, engaging collaborative interactions, and worthy music. In particular I will focus on the Beatbug Network which has been featured as part of the Toy Symphony in workshops and concerts in Europe and the US.

Short Biography: Gil Weinberg

Gil Weinberg is a Ph.D. candidate in the Hyperinstrument group at MIT Media Laboratory. Starting this fall he will serve as an assistant professor of music technology at Georgia Tech. Gil's research centers on designing musical networks for group collaboration with a special focus on devices and applications for novices and children. His publications have appeared in the Computer Music Journal, Leonardo Music Journal, and Personal Technologies and in conference proceedings such as ICMC, CIM and CHI. He has been commissioned to compose and develop workshops and installations by orchestras, art festivals, and museums such as Ars Electronica, the Smithsonian Museum, Deutsches Symphonie-Orchester, the Cooper Hewitt Museum, the National Irish Symphony Orchestra and the Scottish BBC Symphony Orchestra. Before coming to MIT Mr. Weinberg founded Sense Multimedia and served as the director of product design at MusicNotes, where he was responsible for the development of a number of commercial and educational music software packages. He received his MS in media arts and sciences from MIT and his B.A. majoring in music, arts, and computer science from Tel Aviv University, where he founded the electronic music studio in the musicology department and developed the electronic music curriculum.

Gil Weinberg interviewed by Lindsay Vickery

LV: *I understand that you have a background in music for computer games. Is this how you came to the idea of networked instruments for novice musicians?*

GW: The computer games background probably had some influence although the music I wrote for these games was more in the background, ornamenting and enhancing the interaction. In my instruments for novices it is all about the music. I think what really brought me to think about music for novices and children was actually having a child (and later two) of my own. Then I realized that there are no real instruments or programs that allow children to really get creative and expressive with music. Most of the programs force kids to focus on technique and theory before thinking about creativity and expression. When I learned piano as a kid, the whole first year was dedicated to holding my hands right. There was no way I could have thought that this can be fun and expressive or that I can use this instrument to make my own music. I think that technique and theory can wait and actually would be acquired much more effectively when the student is excited and engaged in the creative and expressive side of music. Think about it, if you give a paper and a pencil to an untrained 6-year-old and ask him to create something, chances are that it would be a meaningful and fulfilling experience for him, whether he goes for the abstract or realistic. When you give a piano to the same untrained child and ask him to create something, chances are that nothing will happen. It would probably be a much shorter experience, less satisfactory, and less meaningful. Why is that? Probably because music is a more abstract and time-dependent art form. But it doesn't mean that we can't think of tools that would allow kids and novices to be just as expressive and creative in music as in other art forms. That is what I am going for.

LV: *Can you explain your conception of a networked set of instruments?*

GW: Music performance is an interdependent art form. Musicians' real-time gestures are constantly influenced by the music they hear, which is reciprocally influenced by their own actions. In group playing the interdependent effect have unique social consequences. Social tendencies such as the formulation of leaders and followers or the effect of group synchronization on individual players' dynamics and timing have been shown in classical ensemble performances. In jazz improvisation we can find interdependent routines such as call and response, propagating motives, supporting and contrasting dialogs, and a higher level of leader/follower dynamics. Non-western music also presents its own variations of group interdependency, such as in the case of Gamelan music or Persian art music.

But although these acoustic interdependent models provide an infrastructure for interesting interconnections among players, they do not allow for actual manipulation and control of each other's explicit musical voice. Only by constructing electronic (or maybe mechanical) communication channels among players can participants take an active role in determining and influencing, not only their own musical output, but also their peers'. For example, consider a player who while controlling the pitch of his own instrument also continuously manipulates his peer's instrument timbre. This manipulation will probably lead the second player to modify her play gestures in accordance with the new timbre that she received from her peer. Her modified gestures can then be captured and transmitted to a third player and influence his music playing in a reciprocal loop. Another example is a network that allows players to share their musical motifs with other members in the group. By sending a motif to a co-player who can transform it and send it back to the group, participants can combine their musical ideas and tendencies into a constantly evolving collaborative musical product.

Such interdependent musical networks will be especially effective if they could allow participants to complement and enrich each other without losing

control of their personal contributions. Such networks can allow, for example, for a soloist to guide his collaborators with a simple interdependent touch towards a musical idea that he is interested in, to change a supporting voice into a contrasting one so a desired musical idea will become clearer, to shape a peer's accompaniment line so it would lead towards a new direction when the current one is exhausted, to have a musical response accentuated by the player who sent the original call, to plant a musical "seed" that would be picked up by the group in various manners, etc. An effective network would therefore promote interpersonal connections by encouraging participants to respond and react to evolving musical behaviors in a social manner of mutual influence and response. This unique form of live performance can, therefore, enhance the inherent social attributes of music making that are usually obscured in many other forms of music technology practices. Home studios, sequencers, sound generators and other technological innovations can lead to a privet and isolated practice of music making. Interconnected Musical Networks, on the other hand, bear the promise of brining back music performance to its social context and to its ritual roots.

LV: *How did the instruments evolve? Can you describe the various species of BeatBugs, Squeezables, Shapers, Fireflies, the playpen etc?*

GW: There are two main research goals for the instruments that I develop – to promote engaged and thoughtful musical experiences for novices and children, and to enhance the inherent social attributes of music making. The Playpen and the original Shapers focused on addressing the first goal by utilizing algorithms that would allow players to control and manipulate high-level musical percepts such as contour, stability and tension. The Playpen, for example, was a first (and quite naïve at that) attempt to allow children as young as 1 year old to control the contour of a melody and its rhythmic stability by moving in a playpen full with balls and triggering piezo sensors that were hidden in some of the balls. The more active players got in different areas of the playpen, the higher the contour of the melody became, or the less stable the rhythm got. The playpen was installed in the Children Museum in Boston where I conducted some observations. It was fascinating to see how kids developed personal play patterns, exploring the causality of their actions in various manners. (check my web site for videos and papers for all the instruments - http://web.media.mit.edu/~gili/

I then started to get interested in connecting players through such instruments in an effort to address the second challenge. The first collaborative instrument that I developed was the Squeezables. The instrument allowed a group of players to perform and improvise musical compositions by using a set of squeezing and pulling gestures. The instrument, comprised of six squeezable and retractable gel balls mounted on a small podium, provided an infrastructure for developing interdependent, yet coherent, multi-player interactions. It also addressed a number of hardware and software challenges in electronic music interface design by providing an alternative to asynchronous and sequential interactions with discrete musical controllers, allowing multiple channels of high-level simultaneous input. As a test case for a particular high-level control and interdependent mapping scheme, I invented a notation system for the instrument and wrote a musical composition for three players. The problem with the Squeezables was that it only allowed for continuous and synchronous interdependent control, which was too confusing for players who found the interaction difficult to follow. To address this problem I started to look at adding more coherent, discrete, and sequential musical interactions, which lead to the development of instruments like the Fireflies and the Beatbugs.

The Beatbugs, for example, combine continuous controllers similarly to Squeezables' with more sensitive discrete piezo sensors that can sense hit velocity. The Beatbugs are hand-held percussive instruments that allow for the creation, manipulation, and sharing of rhythmic motifs through a simple interface. When multiple Beatbugs are connected in a network, players can form large-scale collaborative compositions by interdependently sharing and continuously developing each other's motifs. Each Beatbug player can enter a motif that is then sent through a stochastic computerized "Nerve Center" to other players in the network. Receiving players can decide whether to develop the motif further (by continuously manipulating pitch, timbre, and rhythmic elements using two bend sensor antennae) or to keep it in their personal instrument (by entering and sending their own new motifs to the group.) The tension between the system's stochastic routing scheme and the players' improvised real-time decisions leads to an interdependent, dynamic, and constantly evolving musical behaviors. In addition to the free decentralized application I also composed a more ordered composition, entitled "Nerve," in which the rhythmic patterns and their routing was pre-composed. The piece was presented in a number of workshops in Europe and the US, which culminated in public concerts as part of Tod Machover's Toy Symphony. In general, I believe that the Beatbugs network is the most comprehensive project that I developed in its attempt to address all my research goals – promoting social dynamics and collaboration, providing expressive high-level control for novices, providing rich constructionist learning experience, and supporting the creation of worthy music.

LV: *I had a friend who claimed he could hear how difficult a piece had been to write. That his own*

music didn't sound as good when it was too easy to make. Do you ever fear making it too easy to create music?

GW: Always. This is actually one of the troubling issues that is in my mind when I design and developed these instruments. It is an interesting point, which can be addressed in many levels. First lets ask what is "difficult to write"? Was it difficult for Miles Davis to go into the studio for one night (as the story goes) and get out in the morning with "kind of blue"? Was it difficult for Mozart to write his requiem in a blitz (as the story goes?) And how about all these Beatles songs, where they difficult or easy to write? Is "difficult" about how many alterations the piece goes through before it is ready? Is it about the emotional tow of the composition process? In any case I hope that the instruments that I develop allow the players to create, alter and modify their music in interesting ways, be it a difficult process or not, until they are happy with their creation. I also hope the instruments can support an emotional writing and playing experiences if that what the players chose. In a matter of fact, I design the instruments to enhance this creative and expressive core of music making for novices, which is rarely accessible to them. The computer is designed to help in technique oriented and theoretical aspects, which I regard as a less an important learning goal for novices than falling in love with making music before going deeper into lower level details.

And from a different point of view – lets ask what does "writing a piece" actually mean in the field of interactive music. There are probably as many answers to this question as there are "interactive musicians" but I believe that everyone will agree that both the designer and the user shave some kind of a role in this process. And let me tell you, as the designer of the Beatbugs, writing the application was VERY difficult. In a matter of fact it took me 2 years and many failures before I reached a result that I was happy with (more or less.) Finding the right balance between bringing my musical voice as a composer while supporting and promoting creative input from players is not an easy task. And there are all these balances that I mentioned before that has to be painfully maintained. So even if the instruments make some parts of the interaction easier for the players, I will not be the one to testify that it was easy to write.

And lastly, I would love to hear your friend's music. I wonder if what he regards as music that doesn't sound good will also be regarded as such by others. Maybe he will be surprised to find out that the music that was easiest for him to write would actually be the music that I will like best.

LV: *I hear you're moving to the Deep South. What plans do you have for your new job in Georgia?*

GW: Things are pretty exciting down there. The program in music technology at Georgia Tech is just starting and I hope to be able to help in shaping its direction. One of the questions that I am currently addressing is what graduates of the program will do when they grow up. It is not as simple question as it may look. Our field is continuously changing and many music technologists are currently working in occupations that didn't even exist when they went to school to learn the subject. (Musical programming for mobile phones is one example, which may sound a little esoteric now, but probably not for long.) Since not every student is necessarily going to grow up to be an artist or a working electronic composer I am trying to contemplate some possible futures for what the field will look like in 5, 10 years. So while thinking about these kinds of questions and trying to come up with a great curriculum to address them, I will also be teaching quite a bit. I hope this will leave me time for my artistic and research work, as there is a great group of people, students and faculty, at Georgia Tech that it will be fun to collaborate with. I would love to create and be part of a large project, hopefully involving talents from fields that I have very little experience at such as dance, robotics, or animation.

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