



Lonce Wyse

**Music Communication in the
21st Century**

White Paper Series

Issue 07/01

Communications and New Media Programme
National University of Singapore

A Communications and
New Media Programme Publication

WHITE PAPER SERIES is a publication of the Communications and New Media Programme, Faculty of Arts and Social Sciences, National University of Singapore.

Requests for permission to reproduce the *White Paper Series* should be directed to the Head of the Communications and New Media Programme (cnmhead@nus.edu.sg), National University of Singapore, who may grant the request if back issues are unavailable.

Copyright of this paper resides with the author and further publication, in whole or in part, shall only be made by authorization of the author.

Communications and New Media Programme

11 Law Link, AS6 Level 3 • National University of Singapore
Singapore 117589 (65) 6516 - 4671
<http://www.fas.nus.edu.sg/cnm>

Milagros Rivera, Head
mriviera@nus.edu.sg

Lonce Wyse

Music Communication in the 21st Century

Lonce Wyse is an associate professor in the Communications and New Media Programme, Faculty of Arts and Social Sciences, National University of Singapore.

Overview

From a society far away and long ago:

We have also our sound-houses, where we practice and demonstrate all sounds, and their generation. We have harmonies which you do not, of quarter-sounds, and lesser slides of sounds. Divers instruments of music, likewise to you unknown, some sweeter than any you have; together with bells and rings that are dainty and sweet. We represent small sounds as great and deep; likewise great sounds extenuate and sharp; we make divers tremblings and warblings of sounds, which in their original are entire. We represent and imitate all articulate sounds and letters, and the voices and notes of beasts and birds. We have certain helps which set to the ear do further the hearing greatly. We have also divers strange and artificial echoes, reflecting the voice many times, and as it were tossing it: and some that give back the voice louder than it came; some shriller, and some deeper; yea, some rendering the voice differing in the letters or articulate sound from that they receive. We have also means to convey sounds in trunks and pipes, in strange lines and distances.

Francis Bacon, New Atlantis (1624)

Music of today draws on a far wider domain of sonic material than did the note-based music of the past. Potential musical material now includes any and all sound, pitched or noisy, intentional or accidental, and human, machine, or nature made. From a purely quantitative perspective, this expands the space of potential music in the same way that a 3rd dimension enlarges a 2 dimensional space. However, the qualitative changes in the theories of how music works are at least as significant as the quantitative expansion of the sonic domain because the way in which sound takes on meaning in the natural world is so much more rich and complex than the way the notes take on meaning in traditional music.

Music based on all sound is fundamentally computational. The reason for this is simply that there are no other physical systems that are capable of navigating the space of all sound in the way computational algorithms working on numerical representations can. Making music without computers is (evidently) possible, but it must be recognized that particular physical media come with inherent sonic, and therefore musical, constraints and possibilities. Particular algorithms also come with constraints and possibilities, but

there are no theoretical limits to how an algorithm can navigate sonic space, and when taken together, the collection of all possible algorithms that can run on a computer are able to access the entirety of the sonic domain from which the new music now draws its material. Since there are no “natural limits” on the space of sound that can be used for musical purposes, we are left with constraints and possibilities for constructing meaning with music that are either fundamentally human (auditory, biological, neurological, cognitive, social), or compositional rather than merely conventional.

The computational nature of sound and music opens up new possibilities for other aspects of music-making besides sound per se. For example, the bidirectional interface and mapping between human gesture (blowing, bowing, striking) and sound that we formerly called the “musical instrument” also becomes a matter of design rather than a matter of physical limitations or convention. The fact that both gesture and sound can be represented numerically also means that there is the possibility of both spatial and temporal dissociation between a gesture and the sound to which it is coupled, however loosely. A particular gesture in performance might result in many sounds spread out over time and delivered at different locations around a performance hall or even around different parts of the globe.

The nature of the possibilities that arise from the computational foundations of music mean that communications between collaborative performers as well as between performers and audience is now an issue to be explored by composers, instrument (and infrastructure) designers, and theorists. For example, if sounds are not intimately related to gesture, then the tight coordination between performers that traditionally depended primarily on auditory and visual cues now becomes a challenge. Fortunately, the same kinds of technology that pose this challenge can be used to address the challenge because numerically coded performance gestures can be communicated and displayed during performance by technological means in addition to, or even instead of sound. Which ways are most effective, and what new musical possibilities arise in conjunction with new communication strategies is a matter that cannot be addressed by technology alone, and is a subject for future research.

Students and researchers within the Communications and New Media Department, in collaboration colleagues from Psychology, Computer Science and the Music Conservatory, will be addressing these issues with a range of projects, some of which are described below.

New Music and the Networked Ensemble

The objective of this research is to develop new methods and structures to support communication between members of musical ensembles, and to study how specific kinds of interactive communication strategies can enable new kinds of collaborative musical practice and experience.

Music-making is most often a collective activity. Orchestras, rock bands, a cappella quartets, drum circles, choirs, and gamelan are all examples of “ensembles” – people coming together in order to play music. Typically, each participant in an ensemble has their own instrument and specific part to play, and music is the outcome of the collaborative coordination and communication of all the individuals.

Traditionally, musicians in an ensemble communicate through sound (generating and listening) as well as by physical movement and eye contact. Sometimes control is distributed among the performers, other times it is centralized in a conductor, who might also be a

performer (e.g. the 1st violinist in a chamber ensemble, or the *pengendang* in a gamelan ensemble). With new and emerging computation and communication technologies, a far richer set of interactions and control structures can be supported. A simple example was demonstrated recently by PIOrk (the Princeton Laptop Ensemble) performing a piece where one musician (composer/performer Pauline Oliveros) generates sound as an electrical signal that is sent to other musicians who computationally transform the signal in various ways before it is diffused into the performance space as audible sound.

Devices extending the notion of “instruments” play an important role in the networked ensemble in a number of ways. Devices can display information about what other ensemble members are doing, and in this way augment the role previously played by eye contact. One of the key research issues that will be investigated is visual representations for the support of collaborative musical control and sound synthesis.

Haptic (tactile) feedback has long been known to be an important part of traditional musical instrument interaction, and has become more intensely studied as the range of sounds used in music creation expands, and as collaborative music making goes mobile using devices with limited visual display capabilities. We expect physical feedback to become even more important as devices deliver information not only about the sound produced by an individual player, but about the actions of other musicians as well as the potentially dynamic state of ensemble communication and control structures.

Science, technology, and the arts engage in a symbiotic process of coevolution, as can be clearly seen in the history of music and musical instruments. A very different kind of music was written for harpsichord and lighter piano-like instruments than for the grand piano which succeeded them, and at the same time, it was musical demands which shaped the development of the instrument. Similarly, composers and sound artists are pushing into new musical territory inspired by emerging communications technologies, and as we come to understand what is possible and what works musically, new kinds of collaborative instruments will emerge.

We plan to investigate

- 1) Mechanisms for shared control by multiple performers of a single sound-making algorithm,
- 2) new chain-of-control architectures where some subset of performers alter the sound generated by instruments played by other musicians,
- 3) dynamic structures where altering ensemble control structures of (1) and (2) during performance is part of musical performance,
- 4) visual and haptic feedback supporting the interaction between performers during performance,
- 5) the use of mobile devices, with their limited interface and sound-making capabilities, for ensemble music making.

Networked musical performance has been studied in the past primarily under a traditional music paradigm. We will instead investigate how network communication structures can support “all sound” musical paradigms that have been emerging over the last half century. There are three aspects of new music in particular that limit the applicability of previous work on networked ensembles and opens up new issues that need to be addressed.