IMPROVISING WITH SPACES

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This paper explores qualitative changes that occur in voices and instruments in relationships with changing spaces ordinarily held in a stationary paradigm of performance practice, spatial transformations and the effect on sounds in multi-channel speaker systems. Digital technology allows one to compose and improvise with acoustical characteristics and change the apparent space during a musical performance. Sounds can move in space and space can morph and change affecting the sounds. Space is an integral part of sound. One cannot exist without the other. Varieties of sounds and spaces combine in symbiotic relationships that range from very limited to very powerful for the interweaving expressions of the music, architectures and audiences.

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This brief non-technical paper references the practice of Deep Listening®[1], improvisation[2], the Expanded Instrument System (EIS)[3], acoustics as a parameter of music[4] and includes selected recorded examples with differing acoustical characteristics for the music. (All sound files can be downloaded at: *http://www.deeplistening.org/site/pauline*)

Varieties of music and acoustical spaces combine in symbiotic relationships that range from very limited to very powerful for the interweaving expressions of musical art, architectures and audiences. The effectiveness of any space for musical performance is related to intention, architectural acoustics, and to the listening abilities of composers, performers, audiences, technicians, designers and architects.

A good deal of looking often happens without conscious listening among all participants. A worthy goal for the composer and performer is to bring both inclusive and exclusive listening to consciousness and consciousness to listening. Dedicating attention to sound and sounding in consonance with the acoustical space best achieves this goal.

Deep Listening®[6] is a multi-dimensional practice created with the intention of heightening awareness of sound and sounding to connect profoundly with sensations, feelings, memories and dreams. The ultimate intention is the expansion of the consciousness of listening.

For architects the look of the space may take precedence over acoustics. For the audience looking at performers may take attention away from listening. Internal visual imagery triggered by sound may also divide the attention of the listener, distracting from a fuller consciousness of sound.

The desirable integration of looking and listening during which the two modes – visual and auditory – are approximately equal and mutually supportive comes with conscious practice.

Listening with eyes closed in order to heighten and develop auditory attention is especially recommended. This is also true for performers if they are not reading music or trying deliberately to draw attention to themselves.

If a performer is modeling listening the audience is likely to sense or feel the listening and be inspired to listen as well.

Figure 1. *The cistern for water supply for the city of Köln emptied for repair and used for recording "Vor der Flut," Eigelstein Musik Productions, West Germany 1984 .*

As soloist and member of the Deep Listening Band[7] (founded by the author in 1988 with Stuart Dempster and Panaiotis) the shared mission is to seek out, listen to and interact with unusual spaces in order to make music. The band, through the practice of Deep Listening explores natural, constructed, imaginary and virtual spaces with the purpose of savoring their acoustical characteristics. These characteristics in our improvisations are a musical parameter – as are melody, rhythm, harmony or timbre.

Figure 2. *The author recording in the Köln cistern for "Vor der Flut."*

Figure 3. *The author recording in the cistern at Fort Worden, Port Townsend, Washington State for "The Readymade Boomerang" (New Albion). Photo by Gisela Gamper.*

The relationship of spatial acoustics and the acoustics of musical instruments is a complex matter that needs more attention and investigation by all concerned. The band with ears, voices, instruments, technology and multi-channel systems as well as shared experiences and perceptions achieves acoustical explorations. Instruments and voices are transformed in varying spaces by this process. A space is also transformed by sounding it. The natural acoustics of musical instruments and electronics are also transformed.

Deep Listening Band has performed in caves, cisterns, cathedrals, concert halls, and a great variety of adapted spaces including cyberspaces. The beginning of rehearsals involves a listening meditation before sounding the space. Listening brings about new possibilities and feelings.

Listening to space changes space. Changing space changes listening. This phenomenon is termed the listening effect.[8] This understanding pervades all Deep Listening Band improvisations. Thus the stage is set for the power of listening to guide the music. This practice is extended to audiences by Deep Listening® workshops offered prior to concerts.

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Following are examples intended for comparison of the qualities of acoustic characteristics of musical environments and how sounds are affected by these characteristics. Each example involves a duet or ensemble improvised with the space as musical partner as well as being the container of sound.

The first example is an excerpt from *Deep Listening*[9] (1988) a signature recording of the Deep Listening Band. The music was improvised without pre-planning and recorded in a large cistern[10]. The unique acoustical characteristics of the reverberant cistern transform the instruments.

Soundfile: *DeepListeningLearASAexcerpt.wav*

The instruments heard in the example were trombone, didjeridu, accordion and voice. The reverberation time of this underground cistern is 45 seconds. The difference between the direct and reflected sound in this venue is almost impossible to discern. Layering, phasing and standing waves emphasizing and de-emphasizing harmonics and partials transform the more recognizable sounds of the instruments. The experience of performing in the cistern was like being inside a hall of audio mirrors. The cistern itself was performing.

Figure 4. *The author after performing at the Biblioteca Nacional. Photo by Alan Courtis*

Quite opposite to the experience of playing in such a reverberant space was a singular experience of performing solo accordion in the Biblioteca National[11] in Buenos Aires, Argentina. The hall was extremely quiet. The sound of the accordion and its acoustics could be heard directly – There was a near perfect coupling of instrument and hall. The softest sound made could be heard anywhere in the hall. Though the pirate cassette recording from that concert is of low quality the memory stands out as one of the most unusual performance experiences ever. The richness

of the sounds of the instrument had no interference from reverberation and seemed exceedingly pure and new in that remarkable space.

Soundfile: *BiblotecaNatExcerpt.wav*

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Figure 5. *The chapel of the Pomfret School in Pomfret Connecticut*

St. George and the Dragon (1991)[12] an accordion solo recorded in the chapel of the Pomfret School in Connecticut is an interaction with the chapel's acoustics, including a noisy squirrel who joined the music! As requested the room microphones were aimed at the acoustic reflections from the walls and mixed with the direct mics from inside the accordion in order to record the duet that was performed with the space.

Soundfile: *St_George_and_the_Dragon_excerpt.wav*

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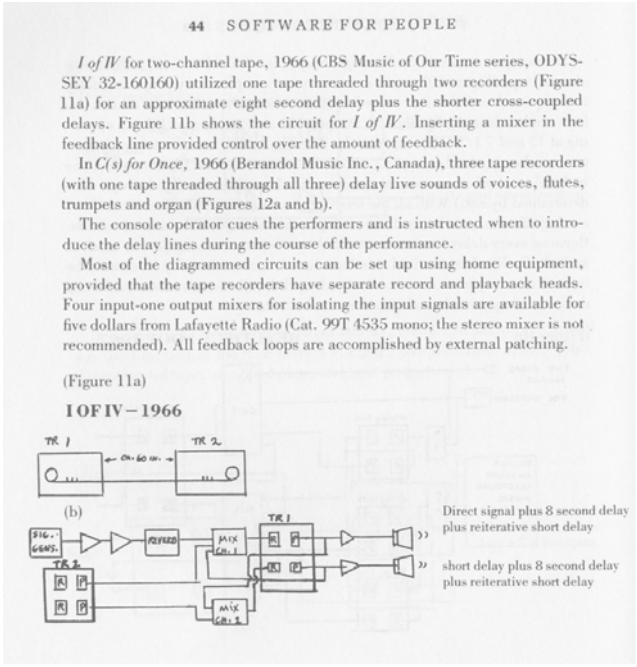
The notion of duet playing with space occurred in 1960 while experimenting with reel-to-reel tape recorders. The short time delay between record head and playback head could be used to create reverberation depending on the amplitude of the delayed sound. This tape delay[13] effect could be extended by passing the stereo tape from the supply reel from recorder one to the take up reel of recorder two. Sounds from both tracks could be routed using a patch bay from the second machine back to the first in a variety of configurations, short and longer time delays and out to multiple speakers. (mixers were not yet available)

Though the recorded results were in stereo there were virtually four channels sounding. Sound sources for the improvisations were heterodyned oscillators. The iterated sounds were layered and transformed by phasing from the returning sounds in the tape delay system.

I of IV (1966)[14] is an example improvised in real time that uses the tape delay system described above.

Soundfile: *IofIV_excerpt.wav*



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I of IV for two-channel tape, 1966 (CBS Music of Our Time series, ODYSSEY 32-160160) utilized one tape threaded through two recorders (Figure 11a) for an approximate eight second delay plus the shorter cross-coupled delays. Figure 11b shows the circuit for *I of IV*. Inserting a mixer in the feedback line provided control over the amount of feedback.

In *C(s) for Once*, 1966 (Berandol Music Inc., Canada), three tape recorders (with one tape threaded through all three) delay live sounds of voices, flutes, trumpets and organ (Figures 12a and b).

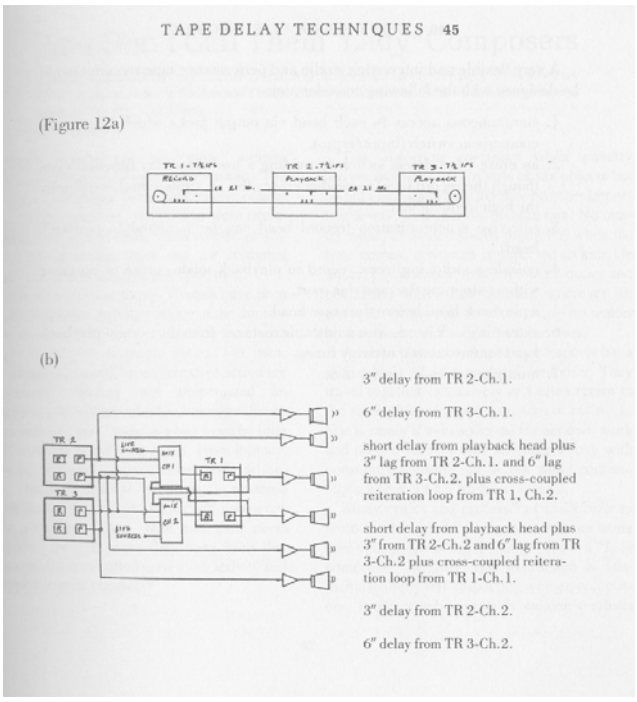
The console operator cues the performers and is instructed when to introduce the delay lines during the course of the performance.

Most of the diagrammed circuits can be set up using home equipment, provided that the tape recorders have separate record and playback heads. Four input-one output mixers for isolating the input signals are available for five dollars from Lafayette Radio (Cat. 99T 4535 mono; the stereo mixer is not recommended). All feedback loops are accomplished by external patching.

(Figure 11a)

I OF IV – 1966

Figure 6. *I of IV description from Tape Delay Techniques for Electronic Music Composers (1969) in Software for People by the author.*



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(Figure 12a)

(b)

3″ delay from TR 2-Ch. 1.

6″ delay from TR 3-Ch. 1.

short delay from playback head plus 3″ lag from TR 2-Ch. 1. and 6″ lag from TR 3-Ch. 2. plus cross-coupled reiteration loop from TR 1, Ch. 2.

short delay from playback head plus 3″ from TR 2-Ch. 2 and 6″ lag from TR 3-Ch. 2 plus cross-coupled reiteration loop from TR 1-Ch. 1.

3″ delay from TR 2-Ch. 2.

6″ delay from TR 3-Ch. 2.

Figure 7. *I of IV description from Tape Delay Techniques for Electronic Music Composers (1969) in Software for People by the author.*

Applied to the accordion or any other acoustic instrument or voice the Expanded Instrument System (EIS). (Pronounced ICE) is a tool for creating and using virtual spaces[15] within acoustical

spaces. EIS has developed from hardware tape delay systems to software over the past 40 years.

Crone Music (1989)[16] is music created with solo accordion and Expanded Instrument System (EIS) still in an analog version. There is the illusion of one space morphing to another. Qualitative change occurs in voices and instruments in relationships with changing spaces that ordinarily are held in a stationary acoustic paradigm.

Soundfile: *CroneMusic_excerpt.wav*

Digital technology makes it possible to go further. A virtual space may sound like the inside of a teacup, a cathedral, or a closet. More than one space may be perceived simultaneously – several sounds may be perceived in separate spaces – a single sound could seem to be sounding from a space inside some other space and endless other creative configurations.

Such progressions may move with continually changing characteristics such as shape, volume and reverberation time and parameters incorporating a range of spatial motion from very slow to very fast.

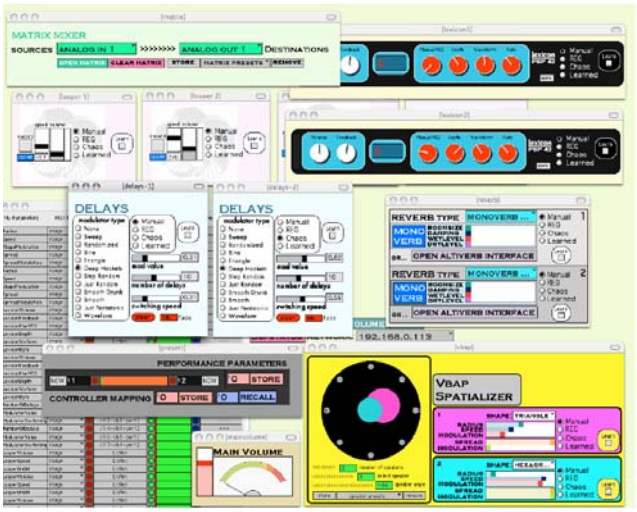

Figure 8. *Graphical User Interface for the Expanded Instrument System (EIS).*

Moving Spaces (2006)[17] was created with four different sounds – wood blocks, percussed conch shell trumpet, thunder tube and serrated wood scraping shell. The four sounds apparently sound in many different spaces and transform in many ways during the course of the piece. Sounds move and spaces move in differing speeds and volume within a 5.1 surround system. The continual transformation of sounds is accomplished by improvisation using EIS. EIS programmed in Max/MSP includes Vector Based Amplitude Panning (VBAP)[18] and Monoverb[19].

Trogolodyte's Delight (1990)[20] was performed first as a concert in the Tarpaper Cave in Rosendale, New York, The Deep Listening Band (Pauline Oliveros, Stuart Dempster, Panaiotis) with guests Fritz Hauser, percussionist and Julie Lyon Balliette, vocalist explored the sound properties of this man made lime stone cave by moving to different locations inside the cave. The audience relocated for each piece. Each part of this large cave had unique acoustical characteristics including the beautiful water drops. The longest reverberation time was 9". After the concert we returned to the cave to record. Among the pieces *Cannery Row* used a variety of sizes of tin cans placed strategically under the water drops to play with the acoustics in another way. The binaural recording of this excerpt from *Cannery Row* was made by the audio engineer Bob Bielectki.

Soundfile: *CanneryRow.wav*

Figure 9. *Deep Listening Band recording Trogolodyte's Delight in the Tarpaper Cave at Williams Lake Hotel, Rosendale NY. 1991.*

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In each recorded example given in this paper the unique characteristics of the environment shape and flavor the sounds of the music heard whether acoustic or electronic. The paradigm of one type of acoustic or environment for a specific performance space or for sounds is challenged in *Moving Spaces.*

Moving Spaces was first presented at Meeting of the Acoustical Society of America in Providence RI, June 8, 2006 during a special session of 5.1 surround performances.

Acoustical characteristics that may be performed as an active and changing musical parameter makes it possible for a single sound to have a multi-dimensional existence – or many contexts – during a performance. This understanding of alternate ways of listening to foreground and background offers new possibilities for improvisers, composers, audiences and architects.

Soundfile: *MovingSpaces_binau.wav*

ENDNOTES

[1] P. Oliveros, Deep Listening: A Composer's Sound Practice, iUNIVERSE 2005

[2] P. Oliveros, Quantum Improvisation: The Cybernetic Presence: keynote address for Improvisation Across Borders UCSD, MusicWorks #76 Spring 2000

[3] P. Oliveros, and D. Gamper, The Expanded Instrument System: New Developments and Implementations, Leonardo Music Journal, Spring 1998; P. Oliveros, and Panaiotis, Expanded Instrument System (EIS) Proceedings of the International Computer Music Association 1992.

[4] J. Stiles, EIS Manual 2005, The Expanded Instrument System (EIS) is a sound-processing program designed by Pauline Oliveros. It has been in development since the late 1950's when Oliveros first began using technology in music performance. While early generations of the EIS were comprised of hardware including tape-based delay systems and analog signal processors, EIS is now manifested as software developed in the Max/MSP programming environment. Jesse Stiles programmed the current version of EIS with many fine contributions from David Gamper, Jonathan Marcus, Stephan Moore, and Olivia Robinson. The programmers would like to thank the Max/MSP community for their kind assistance in developing this version of EIS, especially Ville Pulkki who developed a Vector-Based Amplitude Panning (VBAP) system for Max/MSP

[5] P. Oliveros, Acoustic and Virtual Space as a Dynamic Element of Music, Leonardo Music Journal Volume 5. 1995.

[6] http://www.deeplistening.org – Deep Listening® web site

[7] http://www.pofinc.org/DLBhome – Deep Listening Band web site

[8] Pauline Oliveros, Quantum Listening: From Practice to Theory to Practice Practice, Plenum Address for Humanities in the New Millennium, Chinese University, Hong Kong 2000, MusicWorks #75 Fall 2000

[9] S. Dempster, P. Oliveros and Panaiotis, Deep Listening (1989) New Albion NA 022 CD

[10] S. Dempster, The cistern at Ft. Worden, Port Townsend 70 miles northwest of Seattle WA is a 2 million gallon, 186 foot diameter water tank made of reinforced concrete. It has bee used for several recording sessions.

[11] http://www.bibnal.edu.ar/ Biblioteca National

[12] P. Oliveros, St. George and the Dragon, solo accordion in just intonation (1992) on Pauline Oliveros and American Voices, (Mode 401994). recorded in a stone chapel in Pomfret, CT

[13] P. Oliveros, Tape Delay Techniques for Electronic Music Composers in Software For People: Collected Writings 1963-1980, Smith Publications/Printed Editions 1983

[14] P. Oliveros, I of IV (1966) Paradigm Records Tape Delay Techniques for Electronic Music Composers (1969) in Software for People: Collected Writings 1963–1980, Smith Publications/Printed Editions 1984

[15] P. Oliveros, Acoustic and Virtual Space as a Dynamic Element of Music: Leonardo Music Journal #5 1995

[16] P. Oliveros, Crone Music (1989), solo accordion with EIS, music created for the Mabou Mines theater production of Lear 1990, Tribeca Theater New York NY, Lovely Music Ltd. LCD 1903

[17] P. Oliveros, Moving Spaces (2006) created for the 151st meeting of the ASA in 5.1 surround sound on DVD. DVD audio master prepared by Will J. Swofford

[18] V. Pulkki, Vector Based Amplitude Panning (VBAP) is an amplitude panning method which can be used to position virtual sound sources using arbitrary loudspeaker configurations. VBAP is implemented in Max/MSP.

[19] Monoverb – mono implementation of the Schroeder/Moorer reverb model (mono version)

[20] Trogolodyte's Delight (1990), "What Next" WN0003