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SOME COMMENTS ON THE VISIBLE SHAPE OF TIME FOR TELEVISION AND FUTURE MEDIA A THEORETICAL QUEST

A counterpoint is developing which offers a special complementarity of relationship between musical and visual design. This counterpoint is composed by computer algorithms. I would define such algorithms as the routines of computer instructions that *play out* color design and/or music through solid state memory in time, as an event in time. These algorithms are a performance that could never be performed.

I search for a more appropriate word than *algorithm* or *performance*. In concert, we hear an artist's performance which later may be re-enacted over and over on a laser disc recording. Each time we play the CD, more or less, we relive that original performance. I need a proper word for my own compositions which were never performed, but are still a recording which indeed *relives* my creative choices and temporal options. I offer you my composition, or my set of algorithms, or my recording, or whatever. It must play to you from some form of solid state memory. I'm the composer and performer of this music yet it was never really performed.

Musicians of course resist the idea of *non-performing* music, believing each detail in musical art demands a precious and exclusive effort from a performer. How right they are -- the vitality of all music we have ever known is expressed in acts of performing. Regardless of this perception, however, I refer to an altogether different kind of music. And I must ask: is this new music possible today? Will fast computers allow a genuine musical art that belongs to TV? Will digital visual and audio capabilities permit an art as pure and popular as the diverse artistic musical traditions around the world? In other words, can we find yet another art form able to match our lively musical past?

No doubt with suitable talent we'll invent a new music. It's been done before. Formal pattern interrelations can be composed with algorithmic software today much the way composers created new music in the past employing technologies of their own time. More to the point of these remarks, however, is the idea that there are computer powers promoting a counterpoint in music which involves visual structures possessing the broad temporal architecture of music.

The idea of composing a record in time, similar to music, is already a century old. What about cinema? Moving pictures are like a play or a record of actors or a "CD video" of a dramatic event. But non-performing specialists are involved in creating the temporal architecture of a movie which is filmed scene for scene, one step at a time. Stored in the "solid-state memory" of silver images on reels of film, no one expects movies to play a different tempo and emphasis in front of every new audience, like a stage performer's reactions in live concert. Cinema is a fixed performance, edited by splicing carefully-timed scenes in sequence. More or less, my computer "performances" are fixed like that.

Following a century's growth of technology and new media, the art of film making -- as one example -- has grown into a collective and costly game of chance for everyone involved, from director to actor to best boy. Yet, in contrast to that development, perhaps, we may be arriving full circle: A few special composers are regaining total creative control of a new musical and visual medium. There are vast potentials for music-with-graphics awaiting deployment by a single creative person when allowed the full resources of advanced personal computers.

Color and music have more potential for fusion than the most imaginative composers, poets and artists believed possible. From Aristotle to Alexander Scriabin and Wassily Kandinsky, visionaries have invoked the poetic image of intertwining color with music. Their dream evolved into a kind of collective vision which briefly was called a color organ in the 19th Century and which today is nearer to actual realization, hence the hint of new start up MTV-type programs.

Even so, music combined with visuals on television needs substantiality to realize that ancient collective vision. Computers add content and new integrity by expanding twofold music's formerly exclusive art of TIME. A computer's clock allows compositions in TIME which can be quite as sensitively molded, in their own way, as performers mold their real-time performances. In fact, we've acquired high-resolution numerical control of TIME itself. Solid-state instant replay, faster memory access plus greater speed and band width sharpen all creative potentials. The geometry of pattern, infused with the vitality of color and motion, gains all the emotive power of music.

Systems architecture in this decade has produced music, and graphic generating capabilities combined in one computer instrument. This has become what we rightfully may call the artist's first universal machine: an instrument for combining audio and visual modalities in time.

Founded upon my own vision of a "universal-machine" before the first computers, my study of color-in-motion began as a search for various germinal aesthetic principals useful for developing that essential bifocal instrumentation. With eventual access to computers, later explorations of what I was to call "Digital Harmony" gradually revealed many extensible threads of reasoning. I uncovered aesthetic concepts that suggested how differential functions within a wide variety of geometric algorithms generate order-disorder graphics. Logically, this evolved into my notion for a visual harmony. Mathematical expressions, plotted frame-for-frame on film helped to clarify the principles on a succession of films.

Eventually, it came to my deeper understanding that an arithmetic of resonance and ratio actually embodies the architecture of music. Music's differential arithmetic could complement a graphic differential geometry. Visual patterns, derived from simple periodic geometry, produce order/disorder resonances in actions which relate to the consonances and dissonances, the tensional dynamics and the universal emotive powers of musical figuration, rhythm and harmony. These were summary conclusions I was able to draw from computer film making. They encouraged me to write the book DIGITAL HARMONY - ON THE COMPLEMENTARITY OF MUSIC AND VISUAL ART (McGraw-Hill, NY, 1980.)

Specifically, I was enabled to discover as an operable fact that the basic, quantifiable units of construction for this computer art are: (a) the pixel point of color, and (b) the pure audio sine wave. These two components allow one to compose resonant hetero-senuous art structures as if both elements contributed constructive parts to the whole. With audio and visual components, one constructs a generative graphics in an unprecedented temporal domain formerly belonging exclusively to music. The mathematics which these two elements hold in common provides the basis for the foundation of what may become a true audio-visual art.

Considering such a basic foundation, we may compare two terms used in electronic music jargon: synthesis and genesis. My studies suggested that composing music by computer should stress basic algorithmic or generative processes of genesis. The elementals, pixel and sine wave, can be constructed from "ground up," so to speak, into dynamic visual patterns as well as melodic patterns of unique new timbres and actions, all by algorithms invented and applied by the composer. Heretofore, we viewed each acoustic musical instrument, figuratively, as an algorithm producing its unalterably consistent timbre. Now, as we look at new computer algorithms we see that they may offer *an Einsteinian concept of musical relativity:* a rich domain of variable pitch, time and timber.

This stands in contradistinction to composing procedures of synthesis. Much electronic composing is done on real-time keyboards possessing acoustic wave-form synthesizers. Automatically the emphasis falls upon traditionally fixed scales, timbres, tempos and the live performance.

My own ongoing experience had confirmed that computer instruments offer a unique potential for audio-visual creativity. This potential needn't be bent out of shape in order to synthesize or imitate artworks associated with the art gallery, concert hall or cinema. Compositions like mine belong elsewhere. Dynamic computer art is indeed unique. I've no doubt that future outstanding works will initiate a significant popular audio-visual art medium within electronic arts. Outlets to the public will be on video discs and of course on television which needs this form of audio-visual musical television quite as much as MTV itself needs a lively computer graphics composed and interwoven with new computer music. To this end, we'll employ the computer's expert systems more wisely than merely to imitate or plagiarize the piano, or to simulate some of the present-day highly developed improvisational functions of musical ensembles, which work better without electronics.

The very concept of genesis promoted and clarified ideas about pattern potentials for music with art. My earliest film making had demonstrated that music's methods and traditions, requiring fixed tuning, specified tempo markings and skilled instrumentalists, could be supplanted by inventing and operating with acoustic algorithms in association with graphic algorithms. Here was a new methodology for digital harmony. In sum, I felt I'd uncovered an harmonic basis for audio-visual music.

Located outside instrumental and vocal traditions while retaining a valid harmonic foundation, digital harmony promises to provide a new and different approach for an evolving species of composer/artist. Like a painter's or the sculptor's directness of creative processes, digital harmony is direct. My present composing program, for example, allows direct action with instant feed-back just as a work on canvas or in stone allows for action/reactions -- a kind of performance. Intimate interactions with temporal materials, freely involving tuneable random chance, is a fruitful mother of invention. Vital creative interactions distinguish this composer's relation to material. Resultant works are a sum of countless choices, chance discoveries and revisions belonging to the artist; crucial choices are not subject to outside interpretations.

A work resides in solid-state digital memory with possibilities for instant and almost infinite revision and replay (i.e. playback with the optimum audio-visual detail directed toward a final conception). Such editing flexibility surpasses the interactive direct memory access of ordinary word processors. Music was once the most fleeting and transitory of all the arts. Even in the hands of a *non-performing* composer, and even with an optional graphic counterpoint, music is now a plastic material.

My guess is: a powerful appeal lies within the natural interlace and active coordination of eye to ear, and ear to eye, at the integrated level of digital audio-visual harmony. But who around the world can confirm the expressive power of these relationships until they are brought to life in many, many successful works of art?

Some have doubts about the expressive power of harmonic pattern as presented here, but we cannot forget what is already well known. Examine the twenty or so fugues in Bach's last, great study in counterpoint THE ART OF THE FUGUE to see how dynamic resonant structures, constructed from a mere twelve tones, probe the depths of human feeling.

As for established instruments and methodologies, the refinement of the Baroque family of musical instruments and the generalization of musical notation seemed to open floodgates, producing a great library of ensemble music which is meaningful, fresh and popular today after two to three hundred years. Cherished as this heritage is and will remain, just so, we may expect that the perfection of real-time audio-graphic computer instrumentation (including a feasible interface with TV) offers a development in modern times quite as fruitful as that past.

While Renaissance musical notation permitted an ensemble of musicians to play together in correct time, computer technology has provided simply a total recasting of TIME because of solid state digital memory. TIME, which is the essential dimension of music, which is studied and perfected throughout a performing artist's career; this TIME, in digital memory, can be molded and reshaped over and over like sculptor's clay.

To further summarize and review: a computer's expanded opportunities for an art of color action and music were never well understood. Before the latest, fast digital systems with their real-time generation of both graphics and tones, plus instant replay, beginning in the late 1980s, the options weren't even subject to exploration. Now, overnight, a broad methodology is at hand.

TIME stored in digital memory becomes a malleable material. This singular fact, above all others -- *TIME's new physical tractability* -- has significantly changed musical perspectives. This is what I sought to understand and to control. On film, TIME is fixed into the silver image. But in digital, computer memory, TIME is freely alterable and permanently storable. With access to this new dimension of TIME, a few composers may elect to set aside their here-to-fore cherished and essential musicianship and the ensembles with whom they performed. They'll join ranks with a large fraternity of painters and sculptors.

Since, however, the arguments over art's relation to newly developing instrumentation is an ongoing subject of some controversy, my own experience can provide only this concluding anecdote:

With two homemade devices -- a simple sine wave pendulum array and an optical-printer instrument -- my brother and I composed our first modest international success in the rarified avant-garde of 1940s style "MTV". This early triumph implanted in our minds an urgent, lifelong drive to gain access to a perfected facility that would provide music and graphic capabilities unified within one instrument. All this began at least thirty years before computer technology would make our quest real and possible.

In 1959, I wrote a description of our pendulum and optical-printer methods and theories of composition for the journal of electronic music DIE REIHE Volume #7, edited by Karlheinz Stockhausen. Volume #1 of DIE REIHE included an article by Pierre Boulez in which he raised the question: "Is a concert hall really necessary when the performing artist has been eliminated." As long ago as the 1950s, when electronic music was created by splicing magnetic tape segments, many people puzzled over bothering to enter a concert hall to hear music played over bland loud speakers. Boulez proceeded to ask: "Is it not then necessary to find new conditions for listening or are we to contemplate the reuniting of this 'artificial' music with a 'visual double'? (his quotes)

Reading the Boulez article for the first time, I remember asking myself: "Why must anyone question if this electronic music should have a visual double? Electronic composers hardly need to re-invent the violin or the concert hall. If composers intend to deal at all correctly with their electronic options, they must invent that essential *visual double*."

Possessing a determination to combine "artificial" music with a "visual double", my brother and I continued to search for the universal instrument. We had conceived an indelible dream of *auralvisuality* within a new art form.

Inwardly, for years I envied Domenico Scarlatti and Antonio Solar who, out of royal generosity or through a Pope's largess, seemed to have been provided with the instruments and the patronage with which to compose many hundreds of simple essays exploring a keyboard sonata form that was largely of their own invention (Scarlatti called them exercises -- a term we adopted). The seemingly blissful continuity of their lifelong creativity was exactly what we longed to emulate. Would that my late brother James and I had had such a "gift" of instrumentation. And yet, it's here!

John Whitney in his studio 1989

BACK DOWN TO EARTH:

Some kind of a disclaimer is probably due at this juncture: The system I have brought to Groningen on which to demonstrate my work is a 1986 IBM type 286 computer. Now, there are 386 and 486 systems that are several times faster than mine. That is to say, they offer a graphics many times richer than mine. Deeply, I regret not gaining the financial support needed to acquire equipment and software to try to fulfil much of the possibilities about which I speak. One example in particular: a computer program on which to compose music by sine-wave algorithms, is presently stalled. My enthusiasm for composing those complex sine-wave algorithmic constructs derives solely from the novel experience of making sine wave pendulum sound tracks in the 1940s.

The wonder is that I have come so far. This is largely the result of my association with Jerry Reed, an expert software consultant, who has contributed every component of software for the project since 1986. While the polar coordinate and differential harmonics concepts underlying the graphics geometry has been with me since the mid 1960s, I am truly thankful to Jerry Reed for the present composing software which is now a well tried and tested foundation for my work. I thank him for providing software with which I have been allowed to compose more works since 1986 than during my entire film making career of forty previous years.

Jerry and I desire soon to develop a saleable program both for university and professional markets as well as a simpler more popular program for retail.

My compositions at best are intended to point a way toward future developments in the arts. Above all, I want to demonstrate that electronic music and electronic color-in-action combine to make an inseparable whole which is much greater than its parts.