Abstract Sound Objects to Expand the Vocabulary of Sound Design for Visual and Theatrical Media

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ABSTRACT
In this design paper the author explores the kind of sound objects which are typically used in designing sound for theatre and media then proposes to expand the "vocabulary" of traditional sound design through the use of abstract sonic objects to be associated with specific visual events and visual environments. The use of sonic icons and other sound design for interactive electronic devices is seen as a basis for linking abstract sounds with visual expression. Several experimental design experiments using abstract sound objects to accompany visual communication are described. Also discussed is the role of sound in making communication memorable.

Keywords
sound design, sound art, sound objects, Foley art, sonification

INTRODUCTION

When people talk about the use of sound in film, video and theatre it is often in the context of sound *accompaniment* to visual art forms. The impression is that sound is a minor player compared to the "dominant" visual element. This thinking is largely the result of the way western society has privileged the eye since the invention of the printing press and widespread literacy as noted by McLuhan [11,12], Ong [15], Carpenter [6], Schwartz [17] and others. Yet it is easier for blind people to follow most plays, films and television programs without additional aural content than for the deaf to follow these same media without visual captioning. A high percentage of the content of so-called "visual" media is aural.

A key reason for the confusion, perhaps, is that much of the content of television, film and theatre is human speech. Although the words may be communicated via sound, the audience nearly always *sees* the source of these sounds: the actors saying the words. Indeed, most of the sound found in these media carry a visual component that tells the audience their source. Thus if a car crashes the sound is usually accompanied by visual shots of the crash. And even if the crash is heard out of camera range or off stage, the visual action usually shifts suddenly to the scene of the crash, thereby visually reinforcing the previous sonic element. Even less specific environmental sounds (crickets, birds, waves breaking, etc.) are accompanied by visual images that also indicate the source of these sounds. Thus *watching* the action with its associated sound becomes, in one's memory, the key source of input even when most of the understanding comes via the aural channel.

But there is also a sound used in theatre, cinema and television which is less specific and often not accompanied by a visual equivalent: background music. Where is the orchestra or band which produces these sounds? Nobody expects to see it (except in a "musical" production where the performance of music is part of the play or film). Often "background music" serves as a transitional device or as a mask for unwanted sounds (from old optical sound tracks, for example). Sometimes it is used as a motif to telegraph some expectation to the audience.

Thus the bassoon motif in “Jaws” tipped off the movie viewer that a shark attack was imminent. And sweet violins often let the audience know that two lead characters are starting to fall in love.

The designers or composers of the two basic kinds of sound found in film, television and theatre usually work quite independently of each other and are quite narrowly focused in their activity. The “sound designer” or “Foley artist” (in film) is usually concerned only with providing realistic seeming sounds to coincide with specific actions or natural environmental sounds to suggest a real-world location (though Back [1] has demonstrated that often such designers actually create caricature sounds that idealize or exaggerate the natural sound). On the other hand, a music composer creates completely abstract pitch and rhythm based sounds to evoke mood or to aid a transition or indicate an emotion. Rarely are the two kinds of sounds created by the same individual or designed to serve cross purposes (except perhaps in comedy where, for example, a large tympani or bass drum hit might be used to emphasize a comic pratfall). Textbooks on theatrical and film sound almost universally acknowledge, and limit their discussions to, these two mutually exclusive categories.

The relationship of a designed structure to a “real world” meaning can be precise or vague or somewhere in between. To better understand this lets look first at the role of the designer in one area of the visual world.

LEVELS OF PRECISION IN DESIGN INTENT

Odd Brockmann [5], makes a point about design that offers a good starting point for considering the goal of the sonic designer. He notes that if four pieces of paper are rolled into a ball and thrown into the air they will come down in a random pattern that will appear quite "accidental" to an observer. Someone entering the room will probably guess that they were dropped accidentally or discarded carelessly. But if someone were to enter the room and find the four paper balls arranged to form the corners of a perfect square, most observers would assume that they were "designed" to be arranged that way. For whatever reason, someone intended us to see this specific arrangement.

Lets take Brockmann’s idea a bit further and consider a hypothetical installation art piece presented in a gallery. The installation consists of twelve bricks arranged on the floor of an empty gallery. Perhaps when we enter we would first assume the bricks had been not yet been arranged but had been placed randomly in the room. We might even assume that the artist was trying to make a statement about the indeterminacy of life through the use of “designed randomness.” With further study, however, we realize that all the bricks are arranged such that they delineate invisible "spokes" from an invisible center. The “spokes” each define thirty degree sections of a circle, but the spokes are of different lengths. At this point we would no longer consider the arrangement "random" though it might not be clear why this specific arrangement was chosen by the designer of the installation. We might simply enjoy the asymmetry for its aesthetic beauty.

With some reading of the artist’s notes we learn that the length of each "spoke" is actually designed to represent the average noontime temperature for each month of the year 1999 in the city of Reykjavik, Iceland. We also find that there are several more galleries, each of which contains another similar arrangement but based on the mean noontime temperatures of other cities for the year 1999. Let's assume, in this thought experiment, that none of the cities are identified but that in each room, at the center point where all the imaginary "spokes" cross, a reader sits reading, out loud, literature written by an author from that city. At this point the observer could probably not easily discern the exact temperatures presented by each brick, but could quickly learn which cities had warm climates and which had cold ones by the distance of

each brick to the invisible center point. This information would influence our interpretation of the literature being read and we might even start guessing that one of the cities was in India and another in Northern Europe.

Notice the different levels of precision of the information provided by the bricks according to the various contexts. On one hand the bricks could be random and thus "meaningless" in terms of real-world references. Yet, according to the context in which we viewed the display, we could discern precise information about the mean temperatures of specific cities, or imprecise information about unknown geographic regions. At the most precise level the imaginary spokes would not be imaginary but would be calibrated scales allowing the observer to obtain precise scientific values related to specific cities. Indeed, this more precise kind of installation could be set up in a science museum as an interesting way of teaching children about the climate of different parts of the world.

One can easily imagine any of the installations above being built. Because the bricks would be in the artificial environment of a museum or gallery we would probably always assume we were looking at the design of a designer. Thus the "random" array would really be "designed randomness." Yet we could also experience various other levels of precision which would be useful and interesting according the goals of the installation. Regardless of the level of precision of communication intended in each of these installations, in none would the installation art be likely to be confused with the décor of the art gallery itself.

The point of this discussion is to emphasize that *within a theatrical piece the role of sound can also have these varying levels of cognitive precision*. In some cases the sonification must be precise. If what is needed to be communicated is that a telephone is ringing in an offstage room, then the sound had better be easily recognized as a telephone. But the case can be made for the use of sounds of vastly different levels of precision. Again, because the play is taking place with the artificial space of the theatre the audience will probably never expect totally random sounds – say traffic noise from the street outside – because it will be assumed the theatre is designed to shield against that. Thus if loud traffic sounds are suddenly presented to the audience they will assume that they are an intended part of the production.

This is not to say that useful sounds cannot be designed using random processes. Some of the music pieces created by John Cage for Merce Cunningham were created aleatorically using the I-Ching. Each pitch, each duration, and each choice of instrument to play that note was determined by a random process. Yet it was still presented to the audience as some valid part of the overall dance experience. Cunningham even notes that in at least one such Cage-Cunningham collaboration the placement of the dancers on the stage was also determined by a chance process. [8]

The purpose of this design paper is to consider, especially, designed sound objects that are at some midpoint between "designed random" and "very specific." As a sound artist who has created both sound design and music for theatre and mass media, I have been exploring an expanded sonic vocabulary that includes the kinds of sounds mentioned above, but makes use of additional types of sound objects including some that have their origin in sonic icons and signals related to product design and computer software. Since I am also a designer who teaches, I have also worked with students in the exploration of new sounds which convey their meaning, precise or imprecise, somewhere outside the realm of traditional background music yet more abstracted than a simple Foley effect.

LOOKING FOR NEW SOUNDS IN THEATRE

There are a small number of theatrical sound designers, working with visionary directors, who have begun to expand the nature of sounds used in theatre and have helped bridge the gap between the sound designer and music composer. Probably the most successful and best known of these is the German designer, Hans Peter Kuhn, who has created multi channel soundscapes for several experimental theatre pieces by Robert Wilson [19]. In these performances, the audience is surrounded by unusual abstract sounds presented in an eight channel sound system. Sounds resembling water dripping, "pinging," metallic hits, swooshes, etc. can sometimes be heard, usually at a very low loudness level. These provide an environment, but one much different from either the "natural" soundscape of the traditional sound designer or the musical environment of the composer. Mynatt, Back, et. al. [14] have proposed a similar sonic environment for the workplace, but with the sounds structured for specific purposes.

This author has created theatrical environments similar in purpose to those of Kuhn using algorithmic sound compositions structured based not on traditional music forms found in either classical or popular music, but modeled more on the "designed randomness" of nature. This form of composition evolved for me from a single defining experience: that of hearing the sounds of ropes hitting hundreds of aluminum masts of sailboats moored at marina in California on a very windy day. [20] This led to developing structures on the computer in which individual sound events are controlled by algorithmic processes creating semi-repeating but yet slightly non-repeatable sound structures for use in theatrical performances. Not only is this a useful process for generating unusual sound structures for theatre, it led to the realization that useful sound structures need not bear much relationship to traditional forms of music. Indeed, in my later work with students I have taught students to produce complex sound structures by translating the elements and structures of abstract visual art into complex sound art compositions. [21]

A good deal of my original training was in scene design for theatre and opera. The algorithmic sound structures The Sandbook Studio designed for plays by Ann Wilson and Yevgeny Yevtushenko, films by Cambiz Khosravi, dances by Miriam Modaviani, etc. seem to me to be sonified scene design. They are environment, not object.

FROM SCENOGRAPHY TO HAND PROPS

My most recent interest has been in exploring an expanded vocabulary of individual sound objects to become integrated with visual experience. If my past work was creating sonic scene designs, then perhaps an analogy to my current interest could be considered creating sonic hand props. Can one create meaningful sound objects that bridge the area between simple Foley art (providing sound effects for specific actions, e.g. glass breaking, door opening, etc.) and creating a background? And are there models for these kinds of semi-abstract sound objects?

In looking for models of abstract individual sound events to accompany a visual or tactile event one needs only to look toward everyday industrial products. My own digital camera, for example, makes a "snapshot" sound when it takes a picture – a sound resembling that of a mechanical shutter – to let me know that the picture has been taken. Although this particular sound is quite representational it nevertheless performs an important function since it would be hard otherwise to know exactly when an electronic shutter triggers. Of course, the camera maker could have put some visual indicator in the viewfinder, but that would have either

interfered with the viewing of the picture, or required one to dart one's eyes from the subject to an adjacent indicator.

Other products use less realistic sounds. Some touch screen computers use a sound to indicate that a character has been "typed" and often these sounds are not either replicas of a standard computer keyboard nor that of a typewriter. The digital camera maker could have actually made the "shutter" signal far more communicative. Although the natural "click" resembling a mechanical shutter might provide a comfortable transition for the traditional photographer new to digital photography, it would be easy to let that brief tone convey, perhaps through varying timbre and/or pitch, other important information such as battery charge remaining, number of exposures left in the memory card, etc. Although this information is available on an external display panel on the camera, it requires taking one's eye away from the single lens reflex viewfinder used to compose the picture. As the work of Gaver [10], Brewster [4], Mynatt [13], and Blattner [3], have shown, audible objects can be quite capable of communicating specific information by themselves or reinforcing visual indicators.

Although some sonified interfaces require training on the part of the user, it is clear that some abstract sounds with little real-world reference can actually communicate a message that few would find ambiguous. For example, the sound my vest pocket computer makes to indicate an error is very distinctive. Not only does it alert the user, it definitely communicates a message that what one did was very wrong even though it is hard to think of a similar sound from the natural acoustic world that means "error." My current research involves trying to use such non-realistic sounds to coincide with visual events in order to communicate information about visual objects, much the way my vest pocket computer communicated to me that my action was an error. In this area of sound design the consumer products industry seems to have made more advances than the arts.

The early video game industry used simple abstract sounds to good effect but later games, presented on platforms with significant amounts of memory and fast processor speeds, seem to be gradually copying the realistic and caricature sounds of modern films and television dramas. This tendency toward artistic complexity where simplicity might provide a more novel experience seems common in the media world. Gilbert Seldes, who managed television production experiments at CBS in the early 1940s noted in a museum catalog of 1962 that the limitations of 1940s television equipment created a special aesthetic for television which he hoped would be preserved as an alternative to film language. But, with the film industry taking over television production and advancements in equipment allowing for more elaborate cutting "A separate rhythm for television never came into being." [18]

WHY USE SOUND IN A VISUAL CONTEXT?

There is always the question about whether new sounds are "needed" in visual presentation. If sound design seems like a quirky specialist field maybe it is because sound is not really all that important in communication? Although a thorough study of that question would really be the subject of another paper (or book) there is evidence that information obtained through our ears both makes a more immediate impact on us than visual experience and is retained by most people longer.

The advertising strategist Jack Trout presents a good popular discussion of this in the chapter, "Minds Work by Ear" in his book, *The New Positioning* [22]. He first notes that the dominance of the eye in our culture (what he terms "visual chauvinism") is often supported by the supposed Confucian saying "A picture is worth a thousand words." But he points out that the actual saying from Confucius is "A picture is worth a thousand pieces of gold." He then draws upon research

mostly by Elizabeth Loftus and Thomas Sticht (he makes no footnote citations) to support the view that what is heard is remembered better than what is seen. Some of the research deals with written words versus spoken words but he notes that many elements not reproducible in written language, vocal inflection and tone of voice, have been shown to have an enormous importance on understandability and memorability of messages. This kind of reasoning has also been carried over to the world of commerce and marketing by the German sound designer, Peter Weiss [23] who has created what are essentially auditory logos for business as a means of quickly establishing an identity in sound communication.

But the staying power of sound is also evident in everyday experience, especially in the way that many people can remember the tunes of musical jingles and broadcast IDs long after they have forgotten many visual images from the same period. I have found this in my own experience having been an avid listener to shortwave radio broadcasts nearly 40 years ago. Shortwave stations play a "signature tune" five minutes before air time in order to give listeners a time to tune in their receivers and confirm they have the right frequency. I can remember countless numbers of those signature sounds to this day. The content of most of the programs has been forgotten.

The interior designer, Beverly Russell, using musical references to catalog trends in design and architecture over the period 1970-1990, writes "It is not by accident that I decided to organize these four groups around musical references. Sonic rhythms are an original, basic human communication system. . . Aural art forms . . . reach into people's consciousness much faster than any of the visual media, such as art and architecture." [16]

Finally, the French philosopher, Jacques Derrida, constructs an imaginary dialogue in which the questioner asks "Shall I just listen? Or observe? Silently watch you show me some drawings?" to which Derrida intriguingly replies "Both, once again, or rather between the two. I'll have you observe that reading proceeds in no other way. It listens in watching." [9]

SOUND DESIGN EXPERIMENTS

To test various relationships between sound and other aspects of theatre and video, I developed a series of experiments and demonstrations – some of them as assignments for sound design students – that explore an expanded use of sound in supporting visual performance. Since the purpose of these experiments is to explore the role of sound in making communications more memorable, some of the experiments are coupled with suggestions about how they could be applied in the world of professional communication. (After all, a designer ultimately does work to serve the communicative interests of a client.)

Sonified Words

To explore the use of completely abstract sound objects to reinforce more abstract ideas, I have asked students to find abstract or semi-abstract sounds that represent the qualities of certain words. These words do not have sounds naturally associated with them (as would, say, "water"). Students use tape recorders to capture sounds then use digital sound editing software to modify the recorded sound so as to hide its source. The purpose of this experiment is to try to find sounds that have the quality of the assigned word. This quality should be in the sound itself and not simply recall some other object which has the quality. Thus "fluid" should produce a sound with a "fluid" quality, not one that reminds us of water or another real-world fluid.

I categorize the words into a group of "easy" words and another group of "harder" words, but even the easy words have few literal references to sounds in the real world. It is clear than the words "energetic" and "heavy," for example, do not have an intrinsic sonic component. All of us

can imagine an “energetic” and a “heavy” sound yet each person would probably have a vastly different sound in mind, much different from the sounds associated, say, with the words “clapping” or “walking” (which have strong representational references). With a little more imagination one can even associate sounds with completely action-free and sound-free words such as “noble” and “schizophrenic” (words from the “hard” category). Some other “easy” words used include: nervous, fluid, smooth, flowery, fuzzy, sparkling, dull, itchy, graceful, merry, decaying. “Harder” words also included: rotten, spicy, cruel, plain, rich, rubbery, ejaculatory, evolving, finicky. Naturally “easy” and “harder” are mostly in the eyes/ears of the beholder and some students found it easier to create sounds for some of the “harder” words than for their assigned “easy” ones.

This assignment involves several key skills for the sound designer: listening to sounds around him/her, analyzing the qualities different sounds seem to have, and learning to modify sounds to change their properties. This kind of assignment is equivalent to the “exploring one’s materials” component of design education made famous in the Bauhaus. A surprising result of this assignment to me was how industrial and mechanical many of the sounds were, even for terms which I would have thought might merit gentler and more musical sounds. But, as noted above, the influence of the sounds of consumer products might be producing a new sonic vocabulary in the present generation.

Of course, when a person hears a sound in the above experiment, the word “associated” with the sound does not automatically pop into the listener’s head. It seems doubtful that any non-linguistic form of sonification could produce consistent linguistic associations of this type. But the previous discussion (above) showed that varying levels of precision of what is to be communicated by a designed communications object do not translate into varying levels of utility. There is a place for objects which communicate imprecisely. One such function is to reinforce, not re-state, a verbal or visual experience. Students hearing each others’ differing interpretations of these words generally found the sonic associations intriguing and entertaining. This may be all that is required in a theatrical application.

Presentational Experimentation

At ICAD 99 Millicent Cooley [7] demonstrated the correlation of sounds with images and text using simple sound and visual objects displayed in Macromedia Director. This turns out to be a extremely effective “test bed” for Foley art and theatrical sound design. I have since taken an expanded approach to the same technique in developing new visual-aural linkages. However, my tests depart from Cooley’s in that I use non-representational sound and, in some cases, non-representational visual objects. Some of the kinds of experiments used in The Sandbook Studio and in my classes, and ongoing as we look for new uses of sound design, are listed below:

Text in a sonic environment

Cooley’s software included a little story told with text which appears sequentially on the screen. One could read the text presentation silently, hear it with music or hear it with sound effects equivalent to Foley art in film. The viewer was invited to see how the sound affected the interpretation of the story. Indeed, the sound effects version added a surprise context to the end which changed the impression most people had of the story after seeing/hearing the music version.

Building very directly on the work of Cooley, I have done some work with text stories, but rather than associate representational sounds to concrete events described in the text, abstract sounds were created and linked to words which do not necessarily have a sonic reference. One possible application for this is text and sound banner advertisements for the web. Here a small number of words must be presented in a memorable context. The sounds here can serve three

simultaneous purposes: to sonify the text to make it more meaningful and memorable, to call attention to the banner ad itself on a page of visual clutter, and to reinforce a sonic logo for the advertiser who paid for the banner.

Sound differentiated visual twins

I am also interested in using sound to convey different information about the behavior of two similar forms. Two objects might seem to be visually identical yet sound, in addition to the actual movement of the objects, gives us information about these forms that clearly differentiates them. (Think of this as getting to know the good twin and the bad twin.) Even more important, sounds associated with different objects can be used to predict the behavior of the objects before we see much of their visual behavior. This can be especially valuable in creating sounds for television advertisements in which it is necessary to establish product or character relationships in the shortest possible time due to the 30 second length of the entire presentation.

Advertising research has shown that the mere identification of a competing product in a comparison advertisement can lead some viewers to confuse the benefits of the advertised product with those of the negative comparison. If each product in such an advertisement carried a sound motif that seemed to express a positive or negative feeling (see above) then perhaps this confusion could be lessened. This certainly is a fruitful area for cognitive researchers working in the advertising industry and something that the Sandbook Studio may explore in future research.

Sonified contexts for photographic and theatrical Images

In his 1973 BBC video series, "Ways of Seeing" John Berger [2] showed how the interpretation of an oil painting presented on television could be drastically altered by differences in cutting and musical accompaniment. Building on a variation of Berger's approach, this approach creates a sonic environment into which is placed a visual image or presentation whose content is ambiguous. Although the visual setting, and in some cases even the subject depicted, is unclear, different sounds can help the viewer to establish a mental context for the visual experience. Abstract ambient sound structures are created that have little reference to representational ambient sound environments. Although some could consider this "music" in a broad John Cage sense, it lacks the formal structure, reliance on a particular time base (metre and rhythm), and use of defined pitches usually associated with traditional instrumental music (see discussion above about music based on controlled randomness). These experiments resemble Cooley's use of sound with text, except that the text has been replaced with concrete visual imagery. In this way the sonic environment can add contextual meaning to visual experience which lacks a clear cut visual ambience.

The context setting function of this approach – one very similar to what Kuhn does for the Robert Wilson plays – offers great possibilities for the theatrical designer as well as for film and television sound design. While representational sound can create identification (i.e. "labeling") of locale in the mind of the viewer/listener, more abstract sound can help telegraph attitudes about a possibly unidentified locale. The Sandbook Studio used this technique in designing sound compositions for the New York debut of the Yevtushenko play, "If All Danes Were Jews," and the translator of the English version was extremely excited about how the sounds telegraphed to the audience the nature of a locale minimally depicted visually. He suggested the concept be carried one step further and some of the sounds played in the lobby as the audience waits for the play to start in order to help get the audience in the "mood" for the play. For this production, however, we focused less on smaller sound objects (though there were a few) and more on algorithmically designed compositions using the "designed randomness" technique discussed above.

In a production of Sartre's "No Exit," the concept of the sound object and an ambient "composition" designed for a specific scene in a play were combined. Borrowing from the aesthetic of turntable art (used widely in techno music) the director was given a series of abstract sound structures designed to be mixed in real time to create varying soundscapes which could be adjusted in real time to match the pace and mood of the play as well as the emotional involvement of the audience.

CONCLUSIONS

Can abstract sound objects play a meaningful role in visual art and performance contexts? As a designer I am not engaged in formal "testing" of design ideas in a rigorous scientific way. A designer, rather, puts out a design idea then sees if it intuitively "works" in the context of a communications structure. Thus these experiments have attempted to "play with the possibilities" of expanding the language of sound design for theatre, film, video and the internet. A traditionalist might feel that the kinds of natural sound and music mostly used in theatre a film at present are sufficient. The case could also be made that there are sufficient type face designs in the world and more are not needed. Yet designers seeking a unique look will continue to create new faces. The experiments I have done with abstract sound objects suggest to me that they could be used to give a special sonic character to certain forms of communication (as mentioned above).

Another concern might be the acceptance of these non-representational sounds in the context of all but avant garde communication. One may expect Robert Wilson and his crew to put on a challenging show but what about the person watching a television advertisement, attending a non-experimental play, etc? Here we can clearly point to the acceptance of communication elements over time that would have been considered incomprehensible or unacceptable in the past. The rapid pace cutting of MTV videos and many commercials would have not been understood to contemporaries of D.W. Griffith, for example. And hip-hop music probably would not have been comprehended or considered a viable art form by, say, Irving Berlin. The use of abstract sound objects in one hit movie would probably establish this design form as part of our media culture.

The point of this paper, then, is to invite sound designers to make abstract sonic objects a greater part of their sound "palette" when designing sounds for the media. No longer can be content with representational "sound effects" at one end of the aural spectrum and "music" at the other. The world in between offers a chance for designers and psychologists to explore memorable sonic experiences that can heighten communication effectiveness and reduce imitation in the mass media and performing arts.

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