
An interface for ‘flat music’

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Part of my listening experience has been a coming to terms with a certain set of musical forms that I call ‘flat’. Music in flat form means music that avoids obvious or dimensionally conjunct large-scale goals, points of arrival, ‘climaxes’, sectional boundaries, and the like, and therefore has proven difficult for many listeners. It has become clear to me that this music demands a different listening approach, one at odds with the way music is typically appreciated in the concert hall. This approach is one that composers of music in flat form can facilitate through today’s computer-music resources. What I present here is a specific instance of such an approach: my composition *Sand*, a twenty-five-minute long work for computer-synthesised and processed sounds, was composed specifically to be experienced through a computer-music interface I built in the MAX/MSP environment. This paper explores what I mean by ‘flatness’, how I came to terms with it as a listener, and how this coming-to-terms spawned the idea and construction of the interface. I then discuss the interface itself, the process of interaction with the listener, and technical aspects of the software.

1. INTRODUCTION

As a composer, I am interested in exploring musical forms that challenge me as a listener. The music that I have found consistently to be the most challenging and frustrating, yet also the most rewarding, has been music made in what I will call *flat form*. Music in flat form means music that avoids obvious or dimensionally conjunct large-scale goals, points of arrival, ‘climaxes’, sectional boundaries, and the like. The music and its composer intentionally thwart every attempt we make as listeners to parse it into larger and (hierarchically) larger chunks. The music that represents the flat form idea most vividly includes, especially, nearly all of the works of Milton Babbitt, and some (though certainly not all) works by Cage, Boulez, Ferneyhough, Martino, and many others.

Through my own listening experiences, it has become clear to me that this music demands a different listening approach, one at odds with the way music is typically appreciated in the concert hall. This approach is one that composers of music in flat form can facilitate through today’s computer-music

resources. What I present here is a specific instance of such an approach: my composition *Sand*, a twenty-five-minute long work for computer-synthesised and processed sounds, was composed specifically to be experienced through a computer-music interface I built in the MAX/MSP environment.

I shall begin by explaining what I mean by ‘flatness’, how I came to terms with it as a listener, and how this coming-to-terms spawned the idea of the interface. I will then discuss the interface itself, the process of interaction with the listener, and technical aspects of the software.

2. FLATNESS

To get at what ‘flatness’ might be, let us start with its opposite: what is non-flat (‘hilly’) music? The golden example of a perfect kinetic shape, taught widely throughout the musical academy, is the first movement of Bartok’s *Music for Strings, Percussion and Celesta*. This piece is in what we might call a ‘single mountain’ form. Figure 1 provides an approximate diagram of its large-scale kinetic energy outline.

What is it that we measure with these curves? There are many musical parameters that could tell us that a musical event or passage is ‘important’ or ‘climactic’ – loudness and register are only the most obvious. Others include density, overall level of dissonance or tension, harmonic rhythm, tempo, and a host of hybrid pitch/rhythmic parameters, contextually defined in a given work. These parameters usually work in tandem: In the Bartok, we have, for the first part of the work, gradually increasing loudness, density, and registral span, for example. An important point about this non-flat, or ‘hilly’, music is that because musical parameters are changing gradually, we have the ability to ‘tune out’ of the music (as inevitably happens to many listeners) for periods of time, and then ‘tune back in’ a bit later on, and still know ‘where we are’ in the piece, more or less, along the lines being charted by the changing parameters.

Similarly, figure 2 shows a graph of pitch height in Varese’s *Density 21.5* for solo flute. The curve seems a bit more complex than the Bartok, with sudden dips and swoops throughout, partly because it shows the

¹Groupe de Recherches Musicales (Musical Research Group).

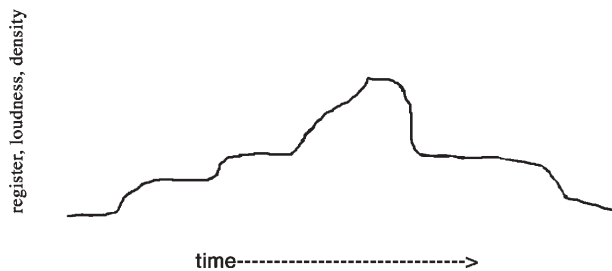


Figure 1. The 'mountain' curve of Bartok's *Music for Strings, Percussion and Celesta*.

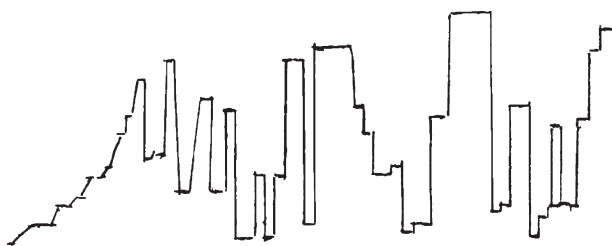


Figure 2. Curve of pitch movement in Varese's *Density 21.5*.

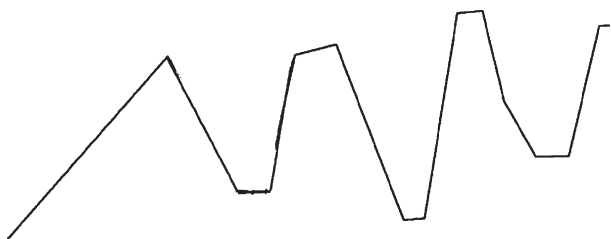


Figure 3. 'Filtered' curve of pitch movement in *Density 21.5*.

most detailed level. Listening to the entire piece, I believe a listener tends to 'filter out' much of this detail, resulting, more or less, in an overall impression, approximately graphed in the curve shown in figure 3.¹ This filtered curve is the equivalent of the Bartok curve shown above.

As with the Bartok, then, *Density* is a work with a clear set of climaxes, or arch shapes, over its five-minute duration – wherein it's possible for a listener to keep track of where the piece is in its general trajectory, even if that listener 'zones out' for a bit here and there. Of course, we would ultimately want to examine the trajectories of other parameters in the work, such as loudness, density, and so forth, and their interaction, but pitch will suffice here to demonstrate the point.

¹I discuss aspects of this 'filtering' process in a brief (part of my doctoral dissertation) called 'Towards a more concrete definition of flatness', which can be read at <http://music.columbia.edu/~chris/diss.flatness.htm#defflat>

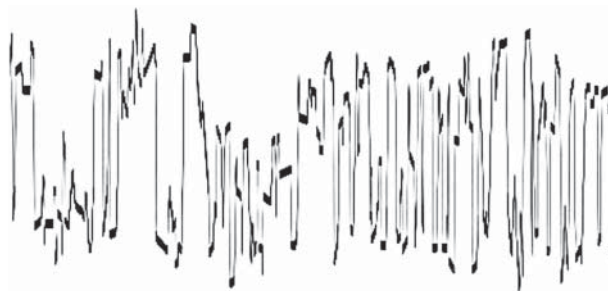


Figure 4. Curve of pitch movement in Babbitt's *Around the Horn*.



Figure 5. 'Filtered' curve of pitch movement in Babbitt's *Around the Horn*.

On the other hand, the pitch height curve for Milton Babbitt's *Around the Horn* (figure 4) cannot be reduced to a simple set of arches as can the Varese. Or rather, were we to 'filter out' the levels of detail in this Babbitt work, the result would be a curve like that shown in figure 5.

This is flatness, and it means a piece can be problematic for the listener; especially over longer passages, it can be difficult to enjoy, to get through, to make contact with. Why? Paradoxically, it is because we cannot ignore it, we cannot 'tune in and out', while still more or less keeping track of the music's overall motion. We cannot detect gradually changing lines of large-scale motion in musical parameters (loudness, pitch register, etc.) that allow us to tune out and then back in, and still know where we are in the progress of the piece; and/or, we cannot 'chunk' it on a large enough scale, so that if we tune out and then back in, we still know which chunk (or, hierarchically speaking, chunk of chunks) we are in. We cannot keep track of 'progress' because there is no progress – no gradual movement in any direction. There is only detail.

Three important points should be made. First, flatness is *not* simply a measure of density: it is quite possible (witness the Bartok example) that a work may be dense and densely detailed, yet outline a clear, 'hilly' arch form. Second, the passage or piece of music in question needs to be fairly long, at least two minutes or so. Below a certain minimum length, almost any piece is 'hilly' or chunkable. Above this minimum duration, flatness will always be relative to unit time, not to the scale of a piece. The kinetic or chunking structure of an entire act of a Wagner opera, or a movement of a Mahler symphony, may seem, compared to the whole piece, quite flat (lots of ups and downs . . . climaxes, climaxes . . . and lots of chunks); however, per unit time, it is still quite 'hilly' – there is enough time between the ups and downs or sections of the music to be able to keep track of it – at least locally.

Third, how 'flat' a piece is, is partly a subjective issue, varying from listener to listener, and varying depending on how familiar one is with a work, aspects of a particular performance, one's mood during a given listening, and a host of other factors.

With a piece like the Bartok *Music for Percussion, Strings and Celesta*, a listener could perform the rather violent act of playing a recording in the following manner: play two or three seconds of music, fast-forward ten or twenty seconds, repeat; until the piece ends. In the end, a listener would probably still get the 'basic idea' of the overall form of the piece – there is a carefully worked-out and worked-toward climax. Using the same procedure on a flat piece, the 'basic idea' would only come out as 'lots of random ups and downs'. To be able to say only that after hearing a piece doesn't speak of having had a very interesting listening experience with it. So how can we make 'make contact' with the music or have some kind of meaningful experience with it?

To get at the answer to this question, I propose a brief analogy with visual arts: for me, viewing a typical late painting by Jackson Pollock as a whole (especially in catalogued reproduction) is not so interesting. But when I walk up to the work and 'zoom in' on a small area of the painting, perhaps a two-inch square somewhere, I am rewarded with an interesting structure, a powerful colour combination, or a set of expressive gestures colliding in some interesting way. In such a local formation, I can find a hierarchy of importance in the details, a depth that the overall painting often lacks.

As with Pollock's 'flat' art, so with 'flat music': exceedingly rich on the micro-level, but often appearing rather poor on the macro-level. Smith-Brindle (1966: 135) warns young serial composers: 'Maximum diversity = maximum monotony'. So why am I interested in this music; why should anyone bother composing with this aesthetic approach? Why not simply write music rich in detail, but that is also 'hilly' or relatively easily chunkable? In answering these questions, I hope to get at another aspect of the philosophy behind the interface.

'Mountainous' music, like the Bartok, or the first movement of Sibelius' *5th Symphony* (to quote another example), is often tremendously satisfying. But, it is possible with those pieces to enjoy the music without really listening to it, to let it 'wash over' you. The first movement of *Music for Percussion, Strings, and Celesta* is teeming with detail, but it is not absolutely necessary to follow that detail to make some kind of contact with the piece. One can easily make contact with the piece through its large-scale aspects, e.g. the carefully worked out climax-form, and then be satisfied with that encounter. There is not necessarily a need to really listen to the details of the work. Much music criticism, out of necessity (due to lack of space), conveys large-scale impressions of works in this manner, and not much else. There is a certain sadness

to this – most people will never know the details of pieces of music, even ones that they're relatively familiar with.

With a flat piece, we are confronted with an inability to engage with the work on this large-scale level, to have this 'washed-over' climax-form experience. This is both a strength and a weakness. I have noted how it makes works more 'difficult' and therefore scares or bores away many listeners who might otherwise find the details of the music fascinating and expressive; but, on the other hand, it forces us to attend to the detail of the music – there is nothing else to attend to. A flat piece cannot be written off with a few sentences describing its overall form or texture.

Nonetheless, for all that I enjoy the micro-level richness of the forms of these works, this music also frustrates me. I usually find a given moment in a flat work to be elegant, exquisite, violent, expressive and/or interesting, often in some bizarre way. But the intense compression, the density in time of all of these exquisite, individuated moments tends to negate their uniqueness; as a listener, my ability to account for each event's individual character, as well as its relation to its immediate surroundings, is dulled quickly. In the best of situations, I am able to 'zone out' for a while, and then 'tune back in' at a later time, but only to catch a few more events, out of thousands, each of which deserves my full attention.

I do not feel the necessity in music for every piece to have an overall formal arch, or hierarchical structure; I like heterarchy and anarchy. What frustrates me about flat forms is simply the fact that the high density of events makes it impossible for me to give each event the perceptual attention it deserves, as an individuated human creation. Yet, I feel that outright rejection is too simplistic a solution to the problems that this music presents; after all, this music also presents us with many musical treasures: vivid, individuated, sonic moments and their local relations. I am drawn to thinking through alternative ways of approaching this music as a listener, and presenting it as composer or hypothetical performer/presenter.

3. THE PATH TO THE INTERFACE

Through my experiences as a listener I tried various approaches to come to terms with this music. Eventually, I hit upon an idea: given a longish flat-form work, I would pick out an arbitrary segment of said music, of no more than a minute in length, loop that segment, and see what micro-listening experience I could get out of it. I would choose some time frame on a CD recording of the work, for example 1:11–1:45, and listen to it seven or eight times in a row. I would 'get to know', in both visceral and felt, as well as intellectual and analysed senses, the passage: its gestures, events, harmonic character, local pitch relations and repetitions, motivic content – whatever presented itself.

This may not seem like a particularly revelatory idea: after all, if I am a theorist preparing to write a paper on a given work, this kind of ‘focused-in’ listening to a certain passage would be essential. However, it is not generally regarded as a ‘natural’ way of listening to music, but rather a way of listening one engages in only when one is doing scholarly research and investigation.

The result of my experiments with ‘zoomed-in’ listening was revelatory, however: pieces that had seemed intolerably dull, too dense, and too flat, suddenly began to open up to me. Enjoyable listening experiences – from the sheer sensual joys of encountering musical objects consisting of varied timbral, harmonic, linear and rhythmic formations (or, most often, hybrids of these aspects), to making any number of quite simple local music-structural associations – became available for experiencing in the context of works in flat form.

I began thinking about these experiences from the point of view of a composer. Today, given the powerful solutions offered by interactive computer-music hardware and software, I could still go for the breathless, exciting, non-stop maximum density of events, but have the piece come with its own interface

that would allow the listener to do this kind of ‘zooming in’ on the work, its little micro-structures and micro-moments. In other words, the listener would be free to choose her own perspectives, and her own zoom-distances, her own chunkings of the work. One could extend the idea: not only would such an interface allow ‘zooming’ in the time domain, but it would also allow for ‘architectural exploration’ of the work on all sorts of levels of counterpoint.

With these ideas in mind, I composed and realised my work, *Sand*, to be experienced through such an interface. *Sand* is a complete twenty-five-minute composition that can be listened through in its entirety, from beginning to end, if so desired. However, I see the ideal encounter between listeners (especially first-time listeners) and the work as being through its interface.

4. THE INTERFACE

The interface is shown in figure 6. It is most simply thought of as a live mixing application; simpler than a mixing application like ProTools in many ways, more complex in others. Like ProTools, or any other standard mixing application, it allows for horizontal, or time-based exploration of the work, via random

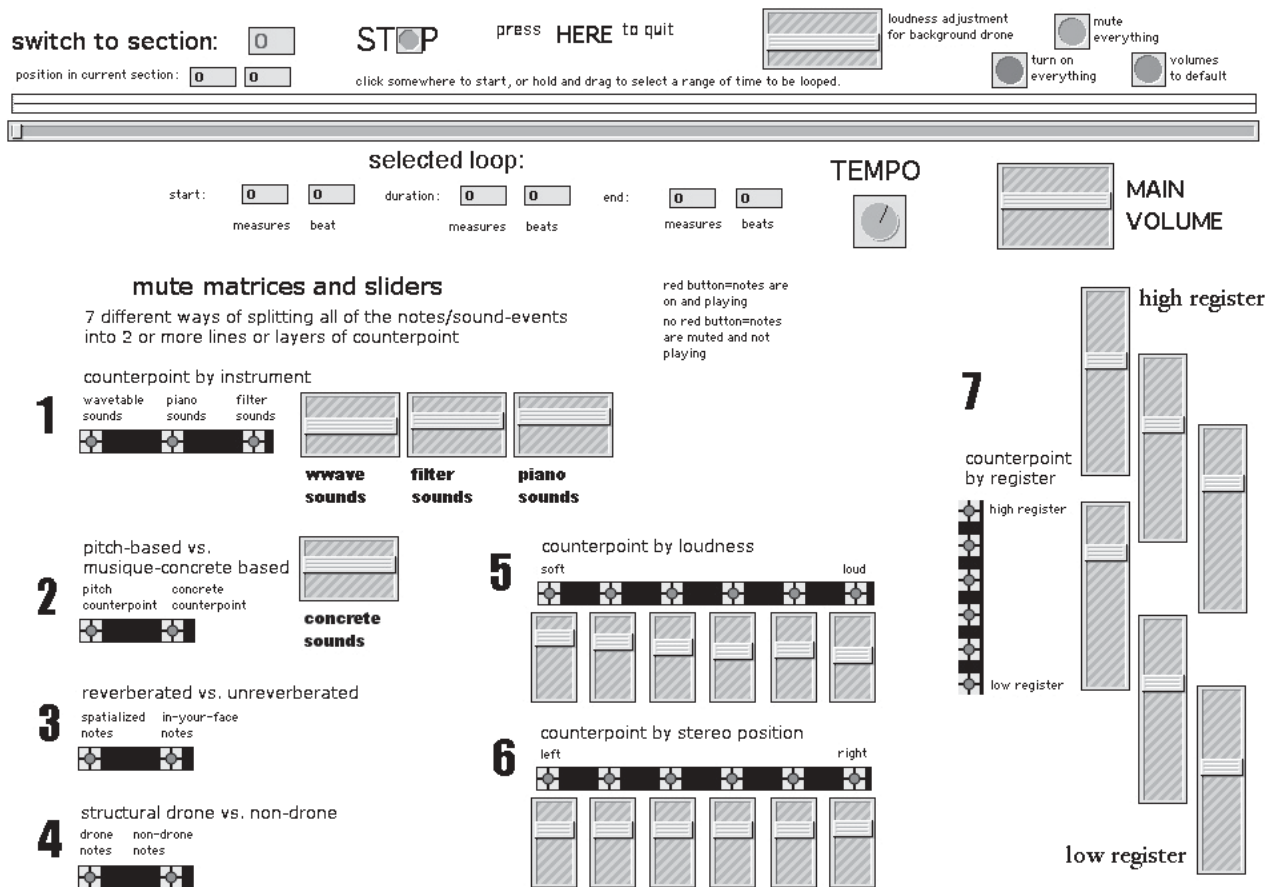


Figure 6. The interface to *Sand*.

access and selecting and/or looping segments of time; as well as for vertical, or contrapuntal exploration of the work, via muting tracks or, in *Sand*, specific lines or layers of counterpoint. The *Sand* interface utilises a multi-faceted, interlocked network of mute buttons, enabling exploration of different ideas of what notes/sound-events (henceforth the term 'note' shall designate any individual sound event, which may or may not be pitched) belong on what 'track'; in other words, enabling a constant re-conceptualisation of the music not easily possible with an application like ProTools.

It is built to work specifically with *Sand*'s own structural peculiarities: time is measured in measures and beats, with nineteen beats to the measure (correlated to *Sand*'s tuning system, which consists of nineteen equally spaced tones to the octave). A timeline of the music in the current section of the piece is found near the top of the display. Ideally, I would have wanted to have the entire piece available for perusal on one timeline; however, for various technical reasons, the piece must be interacted with in sections (seventy-three of them) of six to ten bars each. Since different sections of the piece are of different lengths, there can be no common 'ruler' underneath the timeline, though the current measure and beat are displayed below in number-boxes to aid the listener in finding their way around. Clicking somewhere on the timeline starts the music playing somewhere in the current section. Unless one clicks the timeline again somewhere, the music will eventually reach the end of the current section, the time pointer moves back to the beginning, and the music flows on through the next section. This can go on indefinitely, allowing the piece to be listened through as a whole, if desired. Clicking and dragging on an area of the timeline triggers a loop through that area, and while the selected passage loops, one may engage in vertical (contrapuntal) exploration of the work. Figure 7 shows an area of the timeline selected for looping. Various mute-matrix buttons are switched on or off. These buttons mute or enable various lines of counterpoint.

As in many post-1950s serial works (especially of the Babbitt school), a division of the music into lines or layers of counterpoint happens in several different ways simultaneously. In this piece there are seven possibilities:

- (1) In the most familiar fashion, the music is divided by instrument: there are three 'virtual instruments' in *Sand*, **piano** (processed piano samples), **wwave** (based on time-varying wave-table synthesis) and **filter** (subtractive synthesis on white noise).
- (2) These three 'pitch-structural' virtual instruments form a **pitch** layer which is opposed to a **musique-concrete** layer of found sounds (for more about the composition of the latter layer, see Bailey 2002).
- (3) Reverberated (**spatialised**) notes form a layer, opposed to un-reverberated (**'in-your-face'**) notes.
- (4) There is a constant drone during the piece, which I don't consider a structural part of the contrapuntal web happening above (or around) it. However, a good number of notes in the contrapuntal web are harmonic partials of the drone pitch, and these can form a layer of counterpoint (**drone**), which is opposed to the rest of the counterpoint (**non-drone**).
- (5) Notes in the piece can be divided up according to their **loudness** level, with six possibilities from soft to loud (i.e. *ppp*, *p*, *mp*, *mf*, *f*, *fff*).
- (6) Likewise, there are six possible positions in **stereo** space.
- (7) Finally, there are six **registers** in which a note can fall.

Again, all of these ways of dividing the sounds up into lines or layers are happening simultaneously in *Sand*. One can think of it as a number of different possible perspectives on the same piece, different ways of peering 'into' the web of sound. Each line/layer is referenced by a button which, when off, will prevent any notes with that characteristic from being played. There are also volume sliders referring to the same parameters, allowing for a more subtle variation of the texture. These various lines can, then, be muted or enabled, switched in or out of the mix, by the listener, while the music is playing.

Looking at figure 7, we see that a loop has been set up from measure 1, beat 13, to measure 2, beat 17, in section 29 of the work. Currently, mute matrix #2 is set so that we are listening only to 'pitch-structural' notes, not to the 'musique-concrete' layer. Within the **pitch** layer, according to mute matrix #1, we are only listening to what the instruments **piano** and **filter** are playing, and then only to **spatialised** (reverberated) notes (mute matrix #3). Also, you will note that according to mute-matrices #6 and #7, there are a few **stereo** positions that we aren't hearing from, and the two highest **registers** have also been switched out of the texture. Because all of the mute-matrices are interlocked and cumulative in their effect, we have probably switched out most of the notes in this loop: it's generally better to explore one kind of layering at a time, rather than many types at once, since in the latter case it's very easy to turn everything off very quickly.

As some readers may have surmised, many of these 'parsings' of the music relate to (pre-)compositional (serial) structures. However, I don't expect or desire listeners to be able to follow these structures (although such exploration is, in fact, made possible by the interface). I am interested in simply allowing a listener to pick apart a complex texture in a variety of different ways – and thereby allow meaningful artistic transactions, between composer, composed music, and listener, to take place.

The sound examples illustrate some possibilities for such transactions. It is important that we set the

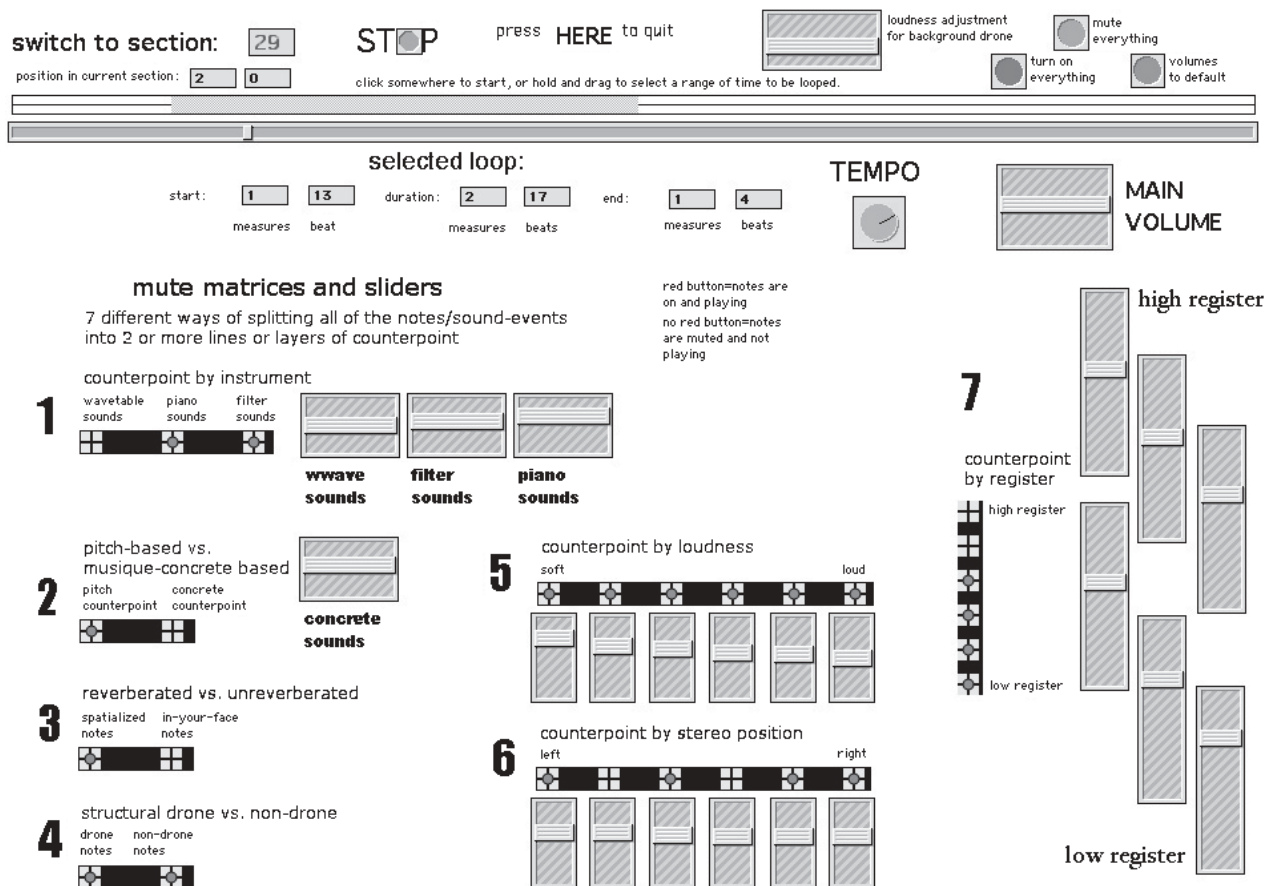


Figure 7. The Interface to *Sand* in operation.

scene, not only sonically and musically, but socially as well. I believe that the musical work *Sand* is best experienced through this interface, in a one-on-one situation between listener and composition, probably over headphones, with the interface acting as the mediator. This is the opposite of the concert experience; it is the most intimate of listening venues. I believe that music in flat form, to be most effective, *demand*s the possibility of this free, intimate, exploration by the listener.

The sound examples on the CD-ROM are numbered 1–4, and to each number is attached a pair of examples, a and b. The first example (‘a’) of each pair illustrates how a hypothetical listener might go through the process of ‘exploration’ or ‘improvisation’ on a section of *Sand* with the interface, the second example (‘b’) of each pair, much shorter, is the ‘source’ – the un-looped version of the section which is extracted and explored in ‘a’. These pairs are analogous, first, to walking through part of a museum, seeing and ruminating; and second, to that part of the museum itself.

Example 1a illustrates the way the interface can, in effect, erase the contentious boundary between ‘minimalism’ and ‘maximalism’. Thus, this exploration begins with a kind of additive process, of the ‘Steve Reich’ type, adding and subtracting layers

(using the drone/non-drone, stereo and instrument button sets) to change the timbre and rhythm of the looping fragment. Towards the second half of the excerpt (44" or so), the **concrete** layer is added [back] into the texture. At this point, all layers are present and switched ‘in’, and a horizontal, or time-based additive process commences, our hypothetical listener gradually adding more events before and after the little loop that the exploration started with. Example 1b is the source of all of this, the section of music from the ‘whole piece’ *Sand* that is being explored here.

From the last few seconds of sound example 2b, a different source section is drawn, the exploration/improvisation 2a, which begins, this time, with only **concrete** sounds (pots and pans being hit in rhythmic patterns); at 22", the **piano** instrument enters the fold, followed soon after by **filter** and then by **wvave**. At the end of 2a, the **concrete** sounds are removed from the texture.

Example 3a sounds like a kind of ‘funeral march’, and it explores a section of the piece (example 3b) which exploits the potential for quite nasty-sounding dissonance in nineteen-tone equal temperament. The big Varese-inspired ‘skyscraper chords’ naturally suggest **register** as the layering to explore, and that’s what can be heard most clearly here, though exploration via instrumental layering can be heard as well.

Finally, example 4b, the source for example 4a, is from one of the densest passages in *Sand*, and thus, though it is a short passage that's being looped here, there's lots of territory to be explored, as can be heard. I won't bother to enumerate exactly what kinds of layering/counterpoint are invoked in this example – I'll leave it to the reader and listener to simply enjoy the results.

5. THE INNER WORKINGS OF THE INTERFACE

The interface was created using MAX/MSP. Because the notes of the musical flow need to be able to be re-mixed in many different ways, every note must be accessible separately from every other note. In other words, the music cannot simply be 'pre-mixed' onto twelve tracks of audio, or the like. Because I wanted every note to be different and richly realised in terms of its timbre, real-time synthesis/processing options were not possible on the equipment I had available to me at the time of composition. Therefore, I developed software (using LISP and RTCMIX on a Linux system) that created the note/sound-events, and these separate note-files were then stored in MAX/MSP **buffer~** files. These **buffer~**s are huge files, even for relatively short swaths of music, which is why the entire piece cannot currently be accessed from one time-line: a machine would have to have several gigabytes of memory. Today's machines are on the cusp of this possibility, and such a situation will no doubt be common in the future; until then, the interface will remain sectionalised. A separate text file, whose eventual destination is a MAX **coll** object, contains data about each note stored in a given **buffer~** (see figure 8).

I will not go into a minutely detailed explanation of the workings of the interface. The basic procedure is as

follows: a given section's **buffer~** and **coll** are loaded into memory. As the music begins to play, clock-times and note-data lines in the **coll**, ordered sequentially, are pushed through several decision-networks. These ask questions, all of which must be answered in the affirmative for the note to be played. Figure 9 presents a flowchart of these 'decision networks'.

As shown in the flowchart, the app waits until the current measure and beat of the clock are the same as those of the next note up. Then it compares the note's **coll** data, indicating which contrapuntal lines the note belongs to, with the current state of the mute-matrices on the interface, i.e. whether or not that contrapuntal line is 'switched in' or 'switched out' of the texture by the user/listener. All of the lines to which that note belongs must be 'on' for the note to be played.

6. CONCLUSION

The idea here is not entirely new: certainly there are videos available of Boulez, Bernstein, and others, dissecting, with orchestras or smaller groups of performing musicians, various works of the modernist and pre-modernist repertory. And of course, the kind of thing one does here is available to an instrumental performer at any time, and is often utilised in rehearsal – the rehearsal process was, indeed, one of the inspirations for this project. The differences here are twofold: first, making this idea available to ordinary listeners, via an intimate, private listening experience they can have with a musical work; second, allowing the work to be examined from so many different angles, zoom-levels, contrapuntal combinations and so on – something heretofore available not even to most performers – but only to the intrepid analyst of such music.

I am often asked whether the interface is applicable to other works. Though this interface was designed specifically to work with *Sand*, it is surely possible to

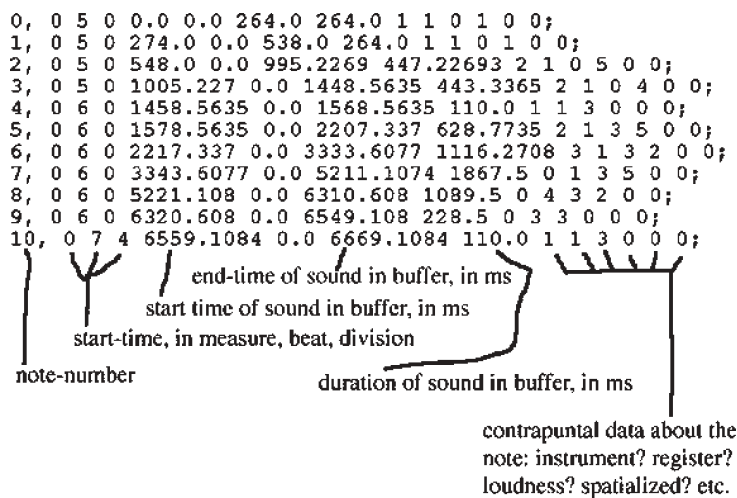


Figure 8. Part of a MAX **coll** list containing data about note/events in a particular **buffer~**.

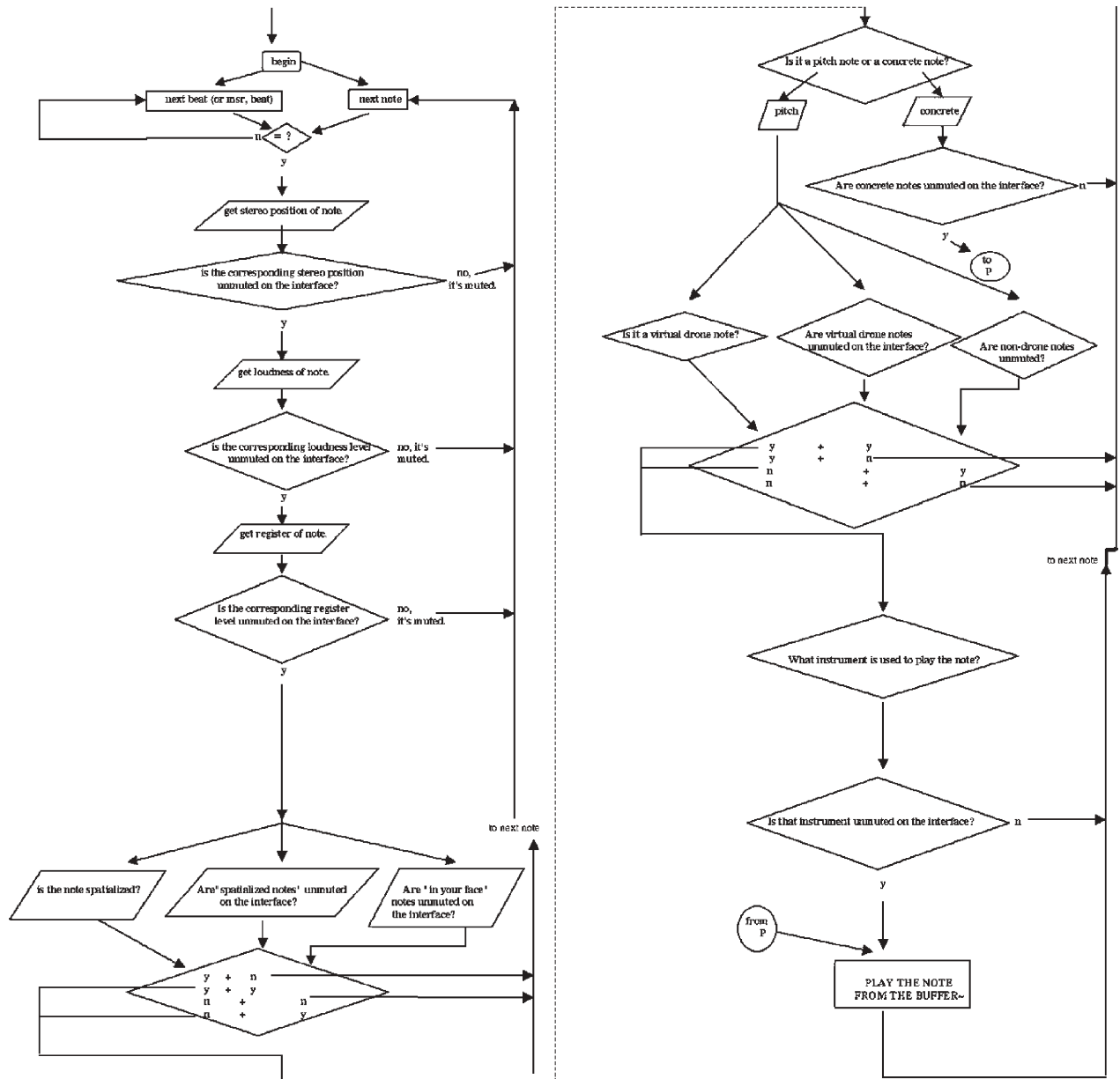


Figure 9. Flowchart of the workings of the MAX/MSP interface.

design a generalised live-mixing system which could accommodate other works and their specific structural individualities. Of course, one could use this idea to dig into the inner workings of a piece by Mozart or Bach; however, I personally am wedded to the idea of using it for works that seem to demand it: particularly the high-modernist ‘flat’ repertoires from the USA, Europe and elsewhere.

I conclude with a quote from composer Robert Morris; he describes flat form in this way:

A piece of music is like a public park or a garden where one puts a lot of energy into the design of the thing to make it interesting . . . there are fountains and hedges and there are gardeners who take care of the flowers and there are some wild parts and some places that are very civilized where food is served. You know, you work all

of this out . . . but when a person goes into this space, he or she doesn’t have to visit its parts in any particular order . . . the piece is waiting for the listener to explore it. (Morris 1991)

I hope that in building *Sand’s* interface, I have enabled such experiences to happen.

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