

The audible and the physical: a gestural typology for ‘mixed’ electronic music

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Abstract

This paper describes the development of a gestural typology for mixed electronic music. The typology embraces both the physical performance gestures used in instrumental music and the audible gestures characteristic of acousmatic music. The aim is to develop a unified approach to serve as a common currency for the discussion, analysis and composition of works involving both live instruments and acousmatic sound. We propose the development of a lexicon of physical-sonic gesture correspondences, which may be of use in composing, analysing, discussing and listening to instrumental, acousmatic and ‘mixed’ musical discourse.

In taking the first steps in developing such a typology, our approach has been to narrow the discussion of instrumental gesture to the piano alone. This allows us explore in detail a deliberately limited range of physical performance gesture, in order to build a foundation upon which typologies considering other instruments may be built in future work.

1. Introduction

1.1 The integration of instrumental and acousmatic music

On the face of it, instrumental music and acousmatic music represent very different approaches. On the one hand, instrumental music belongs to a tradition which we may define broadly as ‘note-based’, or even ‘notation-based’; on the other, acousmatic music might be defined as ‘sound-based’ or even ‘shape-based’. This may not be such a problem when the music is purely instrumental, or purely acousmatic, but it becomes an obvious difficulty when considering ‘mixed’ music, in which there are both instrumental and acousmatic elements.

One widely-used approach which seeks to integrate instrumental and acousmatic thinking is that of ‘spectral music’, which focuses on music as sound. In this approach, the spectral content of sounds is used as models to compose instrumental material. Another possible approach – the one we are proposing - is gestural. In this, we also think of music as sound, but we consider not the spectral but rather the *gestural* content of the sound, adopting an identical approach to both acousmatic and instrumental material, and thus employing the language of gesture as a kind of *lingua franca* with which we can discuss and relate these two worlds. Such an approach should prove particularly useful when applied to ‘mixed’ music.

Of course, we are not presenting today a complete typology of gesture, which is obviously a major undertaking, but to offer a taster of how such a typology might be applied in a particular case, that of works involving piano.

1.2 Definition – ‘sounding gesture’

The concept of ‘gesture’ in music is a complex one. Even within narrow confines of electroacoustic music, it finds many different and at times contradictory uses. Gesture can be a bearer of meaning, a means of expression, the physical actions of a performer, a structural or functional musical unit¹. For the purposes of this discussion, we are using the term ‘gesture’ to mean an *aspect of sound* which links physical human action with audible sonic manifestation. In order to avoid confusion with other meanings of the word ‘gesture’, we refer to this definition as *sounding gesture*.

In the case of instrumental material, *sounding gesture* refers to the manifestation within the instrumental sound of those physical actions the performer undertakes in order to produce and control the sound. In the case of acousmatic material, it refers to the human causes or agencies which the listener may perceive as having resulted in the production or modulation of sound. In both cases the common feature is that of a sonically perceived human agency: thus we define *sounding gesture* as the sonic manifestation of any human physical action (real or imagined) that is directly responsible for (or is imagined to be responsible for) what we hear.

It should be noted here that *sounding gesture* refers specifically to *what may be heard within the sound*. In this respect it differs from other apparently similar definitions, such as Delalande’s ‘effective gesture’ (Delalande, 1988) or Cadoz’ ‘excitation, modification, selection’ model (Cadoz, 1988; Cadoz, and Wanderley 2000). In these, ‘gesture’ refers to the physical action of the player (resulting in sound), whereas *sounding gesture* refers only to what action may be perceived in, or inferred from, the sound itself. In that sense, *sounding gesture* is acousmatic in nature, even if the source is in fact visible - an instrumentalist, for example.

Sounding gesture includes not only physical actions which *excite* a sounding body, but also those which *silence* it (by damping, for example). It also includes, as we shall see, physical actions which do not in themselves create sound, but which are audible in the sense that we know that they are a necessary precursor to those gestures which are audible (we term this *latent sounding gesture*), and gestures which are audible only through their absence (which we term *negative sounding gesture*).

1.3 Disclaimers

A few disclaimers: first, we are not currently not considering the structural functions of gesture, though those could and should be considered in any analysis based on gestural types; second, we are confining our initial typology to gestures at the lowest perceptual levels, although similar principles could and should be applied to higher levels; third, we are not drawing distinctions between levels of gestural surrogacy as defined by Denis Smalley (Smalley, 1992). So, for example, we do not distinguish between a scrape, something which sounds like a scrape, or something which sounds like it’s behaving as if it’s scraping: what we are interested in in all three cases is the gesture of *scraping*. In fact, that is the whole point of our approach. We want to deal in the same way with sounds which have different levels of

¹ ‘a perceptual sound unit, broadly following gestalt rules’.

gestural surrogacy, particularly instrumental sounds on the one hand and various kinds of acousmatic sounds on the other (including instrumental sounds processed in real time); finally, we are not considering here the question of meaning or signification in gesture, but this is not to say that we regard it as unimportant. Sounding gestures are not simply sound-making processes. We consider gestures to be made by some-*one*, not some-*thing*. We define sounding gestures as human actions (or suggestive of human actions, if only at a trace level) precisely because of their ability to carry human ‘meaning’ or ‘expression’ in a musical sense. A sound which suggests a mainly non-human cause (perhaps a pure synthesised tone or a natural environmental sound) would not be ‘sounding gesture’ within our definition, however useful it may be as musical material.

1.4 Methodology – the piano

In order to facilitate the first steps towards developing our gestural lexicon, we have confined our consideration of instrumental sounding gesture to the limiting case of the piano. Unlike acousmatic materials, which may contain an unlimited variety of sounding gestures, instruments have a more limited gestural repertoire. In the case of the piano, this repertoire appears to be unusually limited on account of its sound producing mechanism: through the pressing of keys, hammers are made to strike strings, exciting resonances which start to decay immediately. Extended techniques aside, this pressing of keys and striking of strings will always be the mechanism by which piano sounds are created. Yet piano music clearly contains a wide variety of gestural archetypes: sustained ‘singing’ lines, variegated textures, slowly building *crescendi*, and so on. In the case of singing lines, for example, the *sounding gesture* will have a lot more to do with the production and control of breath than with the striking of strings.

This illustrates a key point in our approach. *Sounding gesture* does not mean simply the literal action performed to make the sound. Rather, it refers to *that which is heard in the sound* that suggests the action performed to make it. In other words, sounding gesture implies an acousmatic listening mode, even when the sound in question is instrumental.

It is the unusual discontinuity between the literal sounding action of the piano and the perceived sounding gestures in piano music which make the piano such a fascinating candidate for the formulation of a gestural lexicon.

2. A Gestural Lexicon for Mixed Music

Our aim in formulating our lexicon is to identify pianistic materials which may be understood according to a gestural classification, with the aim of linking them directly to the sorts of gestural archetypes more familiar from acousmatic music. For each gestural archetype we give examples of piano writing found in works for piano and electronics.

In common with a number of other typological approaches, notably Smalley (Smalley, 1997), the macro-level of our taxonomy deals with three phases of sound making: initiation, continuation and termination. We use ‘initiation’ rather than the more usual ‘onset’ in order to emphasise that we are not just describing the behaviour of the sound, but what we hear of the human action behind the sound: sounds do not simply begin, but sound like they are begun (or ‘initiated’).

In basing our classification on these three phases, we should bear in mind that they do not occur in isolation, but are components of a whole. In musical contexts they will always be heard in combination. It is also the case, as we will see, that a particular gesture may be classified under more than one phase.

2.1 Gestures of initiation

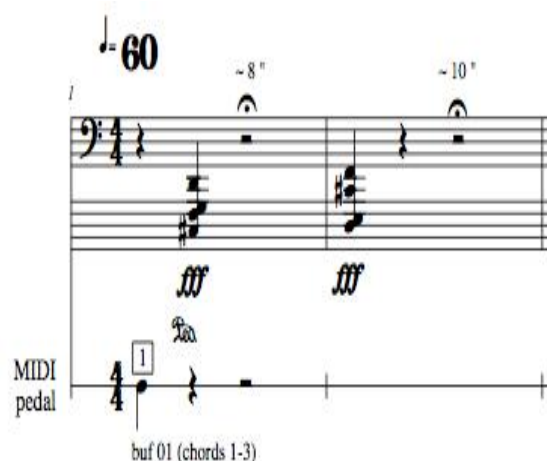
Gestures of initiation are those which supply the initial energy which we subsequently hear as sound.

2.1.1 Percussive gestures: strike and push

The simplest initiating gestures are based on percussion, transferring the energy of an impact into sound. Two important variations of this are *strike* and *push*.

• Strike

In pianistic terms, *strike* is the 'native' excitation mechanism of the piano. It is characterised by its instantaneous nature, in which contact between the striking object and the sounding body is only momentary. *Striking* gestures imply that the striking object makes perpendicular contact with the sounding body, in order to ensure a 'clean' and momentary contact. If the strike is more transverse (a sort of glancing blow), we might prefer to speak of *stroke* or *scrape*.



Example 1: strike – Hans Tutschku, *Zellen-Linien* (p. 1)

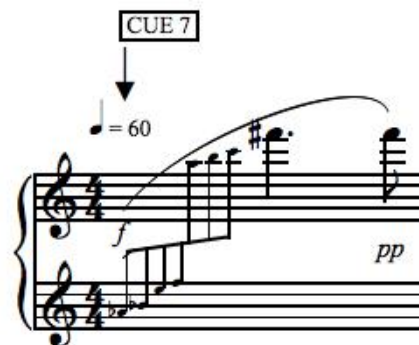
A *strike* gesture will often be followed by a *hold* gesture (see below), which allows the sounding body to respond, although other combinations are possible. *Strike* immediately followed by *damp*, will create a short, staccato sound. *Strike* applied to a non-resonating body will produce a short sound on its own, with no resonating decay. The important point is that while these will all be different *sound types*, producing different spectromorphologies, they share similar characteristics as *sounding gestures* (they are all *strike* gestures).

• Push

Push is a variant of *strike*. The difference is that contact between the striking object and sounding body is somewhat more prolonged, giving it a sense that the striking object is attempting to push through the sounding body by exerting pressure. The prolongation will be brief, allowing the sounding body to respond freely following the excitation (otherwise we would have a strike-damp combination) but it will be long enough for contact between the

striking object and sounding body to result in modifications of the attack portion of the sound, and in some cases the resulting resonance as well. It is this modification that produces the characteristic sonic trace of the *push* gesture. There may be complex, multiple ‘micro-initiations’ resulting from the striking object ‘bouncing’ on the surface of the sounding body, or sometimes damping of the sounding body to some degree, resulting in colouration of the consequent resonance. As with strike, pushing gestures are thought of as directing energy directly towards the sounding body, rather than across its surfaces as with *stroke* or *scrape*.

Push gestures may be realised on the piano in a number of ways, for example through the use of rapidly spread chords and flam effects, which can simulate the complex interaction of a single striking object in brief contact with a sounding body.



Example 2: push – John Young, *X* (p. 2 of score)

This example illustrates the separation between sounding action and sounding gesture. The *sounding action* is that of a fast sequence of strikes, but the *sounding gesture* is a single, elongated and ‘blurred’ strike, or *push*.

On the piano, push may also be designated simply by tenuto. This is a classic case in which the sounding action remains unchanged (the hammer will still make only momentary contact with the string no matter how prolonged the pianist’s key action may be) but the sounding gesture is varied.

2.1.2 Frictional gestures: bow, stroke and scrape

When initiating gestures become more prolonged, the gesture changes from one of percussion to one of friction. This gives rise to a family of gestures which have the special quality of being able to be prolonged indefinitely. This means that they are not restricted to functioning as gestures of initiation, but may also form gestures of continuation.

2.2 Gestures of continuation - bow, stroke, scrape, agitate, iterate

Gestures of *continuation* have two functions: first, they re-supply sounding energy, prolonging the resultant sound; second, they present the possibility of modifying the distribution or discharge of sounding energy, shaping the resultant sound in some way. This latter function makes gestures of continuation central to the shaping of musical expression, which we can in turn identify as a family of related shape-based gestures.

Gestures of continuation may be thought of as lying on a continuum, stretching from a continuous and even delivery of sounding energy at one end, to repeated, percussive initiations at the other. In the middle ground we have various blends of continuity and discontinuity fragmentation or texture:

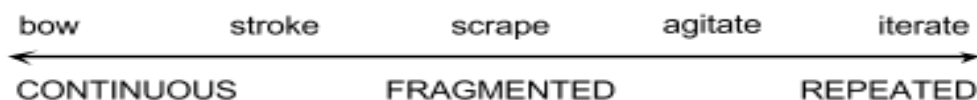
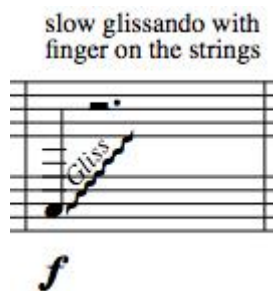


Figure 1: gestures of continuation

• Stroke

Stroke may be thought of as an extended form of *push*, where contact between striking object and sounding body is more prolonged, this prolongation being achieved through movement of the striking object *across* the surface of the sounding body, which creates excitation through friction. An important distinction between *push* and *stroke* is that movement *across* the sounding body creates the possibility of continuing a *stroke* indefinitely, turning it from a gesture of initiation to a gesture of continuation.

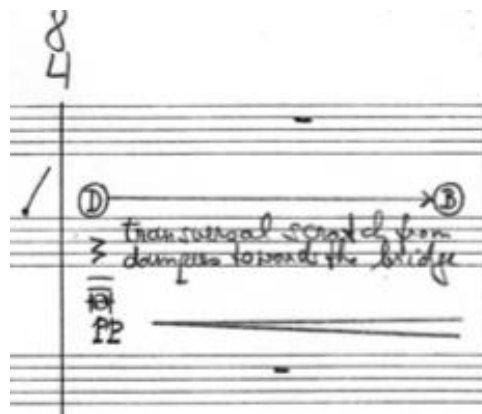
The frictional energy of *stroke* will often be heard as a noise-based component within the attack phase of the sound. If the friction instead produces a resonance, we would use the term *bow* (see below). In the following example, the chromatic pitches approximate the noise-based character of *stroke*, as opposed to the narrower pitch focus of *bow*.



Example 3: stroke – Hans Tutschku, *Zellen-Linien* (bar 200)

• Scrape

Scrape is a close relative of *stroke*. The distinction arises from the nature of the surface across which the striking object is being moved: while ‘stroke’ implies a smoother surface and a more even distribution of frictional energy, ‘scrape’ suggests a rougher surface, which is heard as a more variegated texture, with distinctly discernible micro-events within the internal detail of the sound. Since *scrape* gestures are rather far removed from the native *strike* gesture of the piano, *scrape* gestures will often be most effectively performed inside the piano:



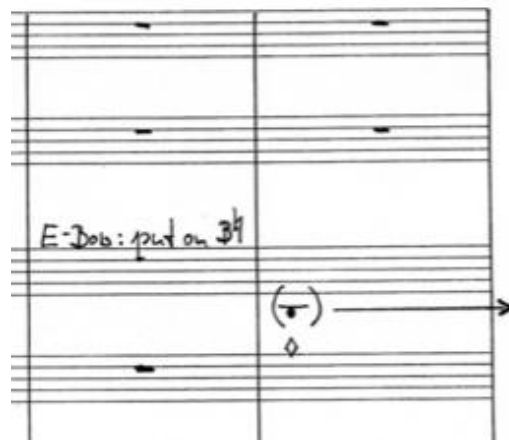
Example 4: scrape – Karlheinz Essl, *juncTions* (bar 8)

• Bow

At the very beginning of the continuity-repetition continuum we have *bow*. Like *stroke*, *bow* delivers sounding energy through friction, but its special quality is this friction sets up a continuous resonance in the sounding body rather than a noise-based sound or texture.

Bow does not necessarily require an actual bow, but might be performed using any implement capable of setting up the right kind of vibrations (a wet finger on a wine glass rim, for example).

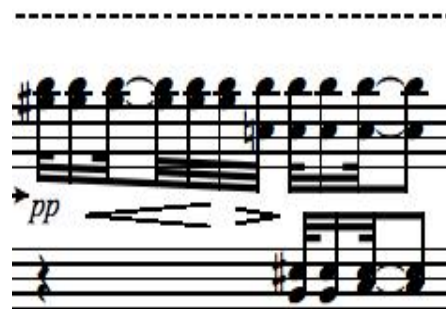
While it is possible to obtain *bowing* gestures using only the piano keyboard, perhaps by using rapidly repeating notes, more convincing results may again be realised inside the piano using implements such as the E-bow (or, as pioneered by John Cage, fishing line with rosin):



Example 5: bow – Karlheinz Essl, *juncTions* (bar 88)

• Iteration

At the opposite end of the continuity-repetition continuum we have *iteration*. This simply involves repeating initiation gestures such as *strike* or *push* so that they become gestures of continuation. This is particularly important for the piano, of course, with its reliance on a sounding action based on striking. This perceptual transformation from individual repeated initiating gestures to a single continuation gesture relies on a degree of feature continuity. When initiations are repeated, we will tend to hear these as a gesture of continuation so long as there is sufficient continuity in the character of each initiation, such as similarities of pitch and dynamic (or, as in the example below, dynamic variation lends an element of ‘shaping’, see below):



Example 6: iteration – John Young, *X* (p. 3)

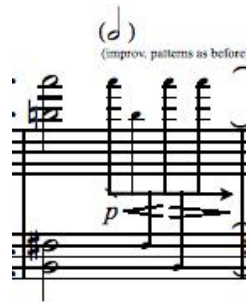
Iterative gestures of continuation do not necessarily have to be continuous in sonic terms. It is possible for the sound to be interrupted, yet the gestural sense of continuity remain. Again, this is more likely if there is some continuity in perceptual features, such as pitch or dynamic (in this example, the repeated pitch is also “looped” in the accompanying electronic soundtrack):



Example 7: iteration – Hans Tutschku, *Zellen-Linien* (bar 10)

• Agitation

Agitation refers to the continuation of sounds by a process of fragmented repetition. Perceptually, it lies somewhere between iteration and scraping. It is more textural and random in nature than *iteration*, but more intentional and ordered than the textures produced by *scraping*.



Example 8: agitation – John Young, *X* (p. 1)

2.2.1 Continuation and Shaping

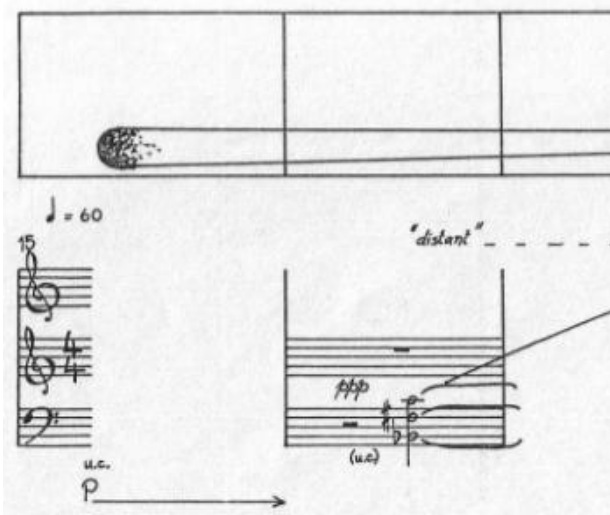
An important part of the continuation phase of a sound is the opportunity to shape the sound in a variety of ways. This will involve adding or removing energy from the sounding body in order to modify dynamic (crescendo or diminuendo), timbre (brightening or darkening, for example) or pitch. Each different kind of shape will form a gesture in its own right, although at the same time shaping gestures will of necessity be a component of some other continuation gesture (such as *scrape* or *bow*) which will act as the ‘carrier’ of the shape:



Example 9: shaping – John Young, *X*

• Transfer

Transfer involves continuing sounds by transferring the sounding energy from one sounding body to another (for example, staccato piano notes continued through sympathetic resonances in undampened strings; piano notes or textures continued by the electronic part, or indeed the piano picking up and continuing sounds from the electronics). The important point here is that we feel there is a ‘transference’ of gestural energy from one sounding body to another.



Example 10: transfer – Denis Smalley, *Piano Nets* (p. 1), the piano picks up and softly ‘colours’ the electroacoustic event

6:56 7:06

The way things fall...

(cut a couple of these bars if necessary) pick up on the trill in digital part (accel. molto.....rit.....)

mp *una corda* *p* *pp* *tr*

Example 11: transfer – Katharine Norman, *Fuga Interna (Begin)* (p. 9), the piano picks up a trill from the electronic part

2.3 Gestures of termination

Gestures of termination are audible chiefly through bringing the sound to an end, although they may also have an audible component in their own right. Silencing a sounding body quickly but inaudibly we term *damp*, while doing so more slowly we call *dissipate*. Damping, dissipation are not absolutes, but form a continuum allowing for varying degrees of termination:

damp string slightly with one finger of the left hand, first only one of the three stings, then slowly roll the finger over the other two strings to increase the damping until only the hammer sound remains

The image shows a musical score for a string section. Above the staff, there is a text instruction: "damp string slightly with one finger of the left hand, first only one of the three stings, then slowly roll the finger over the other two strings to increase the damping until only the hammer sound remains". Below the staff, there are dynamic markings: *mp*, *f*, *mp*, *ff*, and *mf*. The score consists of several measures of music with various articulations and dynamics.

Example 12: dissipate – Hans Tutschku, *Zellen-Linien* (bar 40)

Damping in an audible way we term *interrupt*. This involves terminating the current sound by initiating a new one. The new sound is usually one with more energy and thus capable of subsuming the previous sound. Minimally, the new sound must differ from the previous sound in at least one parameter (for example, dynamic level), otherwise the gesture will tend to be heard as continuation rather than interruption:

The image shows a musical score for an interrupt gesture. It features a staff with a treble clef and a 4/4 time signature. The score includes a dotted line above the staff, a dashed line, and a solid line. There are several notes and rests, with dynamic markings *fp* and *fp*. The score is annotated with various symbols and lines to indicate the timing and dynamics of the interrupt gesture.

Example 13: interrupt – John Young, *X* (p. 3)

Partial damping, where part of the spectrum is damped but other components continue, we term *mask*. This can be achieved by physically muting or damping the strings by applying external objects and materials, through the gradual release of the notes within or release of pedals:

The image shows a musical score for a mask gesture. It features a staff with a treble clef and a 4/4 time signature. The score includes a box labeled "3P" and "We", and a section with dynamic markings *p*, *f*, and *ff*. The score is annotated with various symbols and lines to indicate the timing and dynamics of the mask gesture.

Example 14: mask, Simon Emmerson, *Piano Piece IV* (p. 3), gradual release of pedal while holding one note (f-natural), with additional resonances becoming apparent in the middle pedal

• Passive termination

Gestures of termination may be passive as well as active. If a non-resonant object is being excited by a continuous scraping gesture, the sound will immediately stop when the scraping is discontinued. We hear the ending of the continuation gesture as a gesture of termination.

In addition to gestures corresponding to the three phases of sound events, we identify two further classes of gesture which may be present in all three phases. These are *latent gesture* and *negative gesture*.

2.4 Latent gesture

Latent gesture refers to the that part of the physical sound making process which is not in itself heard, but which the listener feels is necessary for the audible part of the gesture to exist. The most prevalent form of this is the preparation for a *strike* or *push* gesture, which in musical terms may be thought of as an anacrusis or up-beat. When we hear striking gestures, for example, we tend to infer a preparatory gesture of corresponding energy.

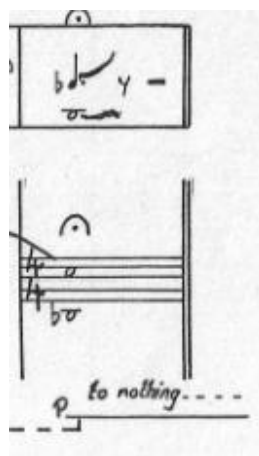
To a lesser extent, we will also hear latent gestures linked to continuation or termination gestures. For example, if a loud resonance is suddenly damped, we perceive this to be an intervention requiring considerable force, and thus a correspondingly large preparatory gesture. For example, a loudly resonating tam-tam being suddenly damped will imply a forceful action doing the damping.

In the case of the instrumental part, latent gesture may often be visible, while in the acousmatic part it will not, although composers of acousmatic music will often actualise latent gestures by using a sound which functions as an anacrusis (such as resonances in the acousmatic part triggered with piano chords).

2.5 Negative gesture

Negative gesture is gesture which we perceive through the absence of its opposite. As with the negative of an image or the cast of an object, we perceive its nature through the impression its absence creates. Negative gestures may be perceived in all three phases of gestural activity.

The most important negative gesture is a gesture of *continuation* in which a resonating body is allowed to sound freely. For this we use the term *hold*. (Hence the formulation ‘strike-hold’ for the action of a piano.) Negative gestures of *continuation* may be perceived in decaying resonances. Many resonant sounds, once initiated, will tend to decay naturally if there is no intervention to continue them. In some circumstances, particularly when decaying resonances are of significant duration, we may hear this lack of intervention as an intentional absence of gesture. Such decaying resonances will give rise to a sense of stillness or expectation as a result of the listener perceiving an opportunity for an unseen agent to intervene (either by damping or re-initiating the resonance) but refraining from doing so.



Example 15: hold – Denis Smalley, *Piano Nets* (end of 2nd movement)

Negative gestures of *initiation* may be perceived in particularly conspicuous silences, particularly when those silences are preceded by sequences of audible gestures. The following silence creates the impression of an unseen agent actively refraining from initiating further sounds, which in turn may create an active and energetic sense of expectation.



Example 16: hold – Andrew Lewis, *Schattenklavier* (ending)

Negative gesture in mixed music is further enhanced by the presence of a visible agent (the performer) who embodies this sense of expectant inaction. The sight of the performer actively doing nothing (other than listening and waiting) can enhance the sense of negative gestural energy implied by the acousmatic or instrumental sound, or by extended silences.

3. Conclusion

Gestural typology offers a useful way of understanding musical material that is equally amenable to instrumental or acousmatic materials. As such, it promises to be of particular value in the field of mixed electroacoustic music. In order to be taken further our future work needs to be extended in several directions. First, the lexicon of gestural archetypes needs to be both expanded and simplified, so that the relationships between related gestural types are clearer. Second, the lexicon should be put to use in analysing complete works for piano and electroacoustics, in order to test its usefulness for the purposes for which it is being created, to refine the taxonomy in the light of that, and to suggest new ways of understanding musical discourse, perhaps by identifying features such as gestural transformation. Third, we need similar exercises undertaken for instruments other than the piano, in order to explore instrumental sounds which use other kinds of sounding actions and thus other kinds of native sounding gestures.

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