For a morphology of interaction

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In mixed electroacoustic music it is common to find the erroneous conception according to which interaction should base itself exclusively on the *fusion* between instrumental writing and electronic devices, whereas the *contrast* between these sound spheres is as significant as the *fusional* states. Although fusion may be seen as the most important ingredient for an efficacious compositional strategy concerning interaction, it is actually through contrast that the identities of spectral transfers in mixed composition can be evaluated by the listener. This text intends to introduce a discussion about the many possibilities offered by the morphology of interaction between acoustic sources and electroacoustic resources and structures. In this sense it tries to identify intermediate types between the extremes of pure fusion and pure contrast, which can be established by the composer that sees in interactive music one of the most advantageous poetic realms of electroacoustic music.

1. FROM THE MORPHOLOGY OF SOUND OBJECT TO THE MORPHOLOGY OF INTERACTION

One of the most relevant consequences of the invention of *musique concrète* by Pierre Schaeffer in 1948 was his progressive elaboration of a new *solfeggio*, not anymore dependent on the articulations which are made possible through musical notation (*escrita*), but on the sound and its phenomenological perception. In spite of all theoretical inadequacies of the Schaefferian thought – contradictions that are almost inevitable for a pioneer – Schaeffer's merit is undeniable concerning a first attempt, well-developed for an inaugural stage of reflection, of a *morphological* and *typological* approach to sound, contributing substantially to a new understanding of the sound phenomenon, either for the active musician or for the attentive listener.

Even so, few were those who tried to take ahead, in a consequent way, the discussion concerning the terminology employed by Schaeffer[2]. However, if these concepts have been anyway developed, a domain has remained practically intact in that discussion, largely due to the sectarian character that impregnates the several aesthetic currents of what is today generically designated electroacoustic music. It concerns the problem of *interaction* between instrumental writing (*escritura*) and electroacoustic resources.

2. TYPES OF INTERACTION AND THEIR LEGITIMACY

Although there are, on the one hand, some composers who insist on the decreed death of instrumental music, and, on the other hand, others who doubt the value of pure electroacoustic music (recorded on some technological mean and without the instrumentalists' presence), such exclusionist postures lose more than win in that they remain tightly closed to the structuring and expressive possibilities provided both by the potentially rich musical writing as well as by the inexhaustible universe of pure electroacoustic composition, known as *acousmatic music*. In that context, it may be extremely fruitful if we consider the endless structural and expressive possibilities of the so-called mixed or interactive electroacoustic music, in that both forms of aesthetic approach are incorporated in the same composition.

A preliminary verification becomes necessary: the interaction between instrumental writing and electroacoustic structures can certainly be elaborated with more effectiveness, at least in the current technical conditions within which this phenomenon is manifested, if the composer considers above all the interrelation between instruments (or voices) and electroacoustic sounds on some fixed medium (*sur support*), independently of whether he/she makes use of transformational resources running *in real time* (or the so-called techniques of *live-electronics*) simultaneously with the pre-elaborated sounds in the studio.

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[2]Besides Michel Chion's indispensable conceptual explanations (cf. Chion 1983), it is mainly François Bayle (cf. Bayle 1993) and, later, Denis Smalley (cf. Smalley 1986, 1997) who make the few well-known attempts of theoretical development of the Schaefferian concepts.

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It is common to find a prejudicial vision within composers, which embraces the mix of instrumental writing and the electroacoustic medium mainly in consequence of their appreciation of instrumental writing and its history, in which the electroacoustic resources are admitted only if these, without exception, interact in real time with the instrumental performance, as transformational resources accomplished *in loco* and, they affirm, with the same temporal flexibility the human interpreter has. However, although such possibilities are very interesting, and such an interaction that has to do with the *live* articulation of musical time is highly desirable and captivating, there is nevertheless no plausible reason, in fact, for the refusal of the possibilities of the interaction that arise from the use of electroacoustic sounds fixed on some technological support as its main resource.

As a matter of fact, to this day, there are still many more possibilities of spectral and structural elaboration in the laborious sound constitution accomplished in the studio and registered on fixed media than in the resources, still considerably limited, of sound generation in real time originated from an interaction with the sounds of instruments. In general, the musical structures provided by transformations in real time are excessively limited to the instrumental structures themselves, while, through the use of electroacoustic sounds pre-elaborated in the studio and its interaction with the musical writing, we deal with a much larger range of sonic possibilities, which are close to or distant from the acoustic universe with which they try to interact.

Recent developments of compositional tools – as for instance (and above all) the Max/MSP software idealised at IRCAM – considerably enhance the possibilities of live-electronics, in that it becomes possible, during performance, to integrate other procedures such as real-time sound synthesis as well as to control the reproduction *in loco* of pre-elaborated sounds. Such hybrid resources bring to the real time domain certain aspects that transcend the traditional meaning of live-electronics discussed here, directly connected to live spectral transformations of instrumental/vocal sounds. Nevertheless, even so *real* time could never be compared with the unlimited possibilities of spectral elaboration and control the composer has in a *differed* time.

In short, the transformations in real time, although constituting a highly interesting aspect of the strict correlation between instrumental gestures and their electroacoustic metamorphosis, act relentlessly and exclusively in a *convergent* sense, if we consider the sources of sound emission. We will verify, however, that as much proximity as estrangement should be longed for by a mixed composition.[3]

3. THE SECTARIAN THOUGHTS AND THEIR PREJUDICES

In the ambit of such placement, we observe two crucial aspects of the problem. Firstly, it is necessary to recognise that the critic of Boulezian stamp (in spite of the great value of Boulez's interactive works), according to which a *fixed time* on support media can never turn organically into a successful interaction, does not make any sense, because the effectiveness of interaction won't ever depend on the fact that the electroacoustic sounds are fixed or not on some technological medium with their predetermined duration, but rather on the elaboration of such an interaction in the actual composition, in agreement with its morphologic possibilities. Considering the great tape works of the history of electroacoustic music, countless are the relentless proofs that 'fixed time' will, in fact, never be noticed as a 'rigid time'. The listener, indeed – as well stated already by Messiaen (cf. Messiaen 1994: 10) – will perceive much less the existence of time the better the composition is organised, the more elaborated and complex is thus the music. The decisive factor of the 'rigidity' or absence of 'rigidity' of musical time is not the physical medium, but rather the way in which the composer organises his/her structural and expressive elements. It is the structuring of the work that should be flexible, not its material medium. It is in this sense that François Bayle is fully right when he states that the true *support* of sound is not *matter*, but rather *energy* (Bayle 1999: 145, 151). Which listener would take a risk to proclaim as 'rigid', concerning time perception, works such as *Le Voile d'Orphée* by Pierre Henry, *Gesang der Jünglinge* by Stockhausen, *Epitaph für Aikichi Kuboyama* by Herbert Eimert or *Visage* by Luciano Berio, to name just some historical examples of the best '*tape* music'?

The second aspect has archetypal character and is rigorously independent of the means with which a work is composed. In *Problems of Harmony* (1934), one of his main texts, Arnold Schoenberg speaks about the essence of the tonal system and its double function – *unifying* and *articulating* functions – and searches that which is indispensable to a composition, independently of tonality itself. He enunciates the principle that is required in all and any musical idea (Schoenberg says more precisely: 'In every exposition of an idea') as *coherent contrast* (Schoenberg 1975: 278). Through the agglutinating

[3]In this context, I wish to relate an anecdote. I had the privilege of being invited by the GRM to take part in a concert together with Luciano Berio in the *Salle Olivier Messiaen* in Paris on 25 February 1997. In this concert, I diffused through the *Acousmonium* (loudspeaker orchestra of GRM) my work *Parcours de l'Entité* for flutes, metallic percussion and tape, and Berio diffused his tape piece entitled *Chants Parallèles*. After this event, Berio unexpectedly sent me a letter to São Paulo, dated 5 March of that same year, with the following words: 'Your work was very interesting and I wonder, instead of using a magnetic tape, why you don't develop your ideas with live-electronics?' I replied in a letter of 2 April: 'I don't believe that the techniques of live-electronics are up to offering the composer all the possibilities that are already accessible with the recording on tape. In general, I think that the sound structures of live-electronics are very dependent on the instrumental structures, so that the contrast between instrument and electronics is not always accomplished satisfactorily. Their identity perhaps yes, but their contrast (so fundamental as *their* identity) not yet'.

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polarisation of the tonal centre, as a kind of *centre of gravity* of the harmonic context, the tonality assumes unity with the material; through the differentiated and even ambiguous articulation of structural elements, it reveals the contrast, the distinction, the opposition. Retaking that old lesson of Schoenberg, we can then ask: why would every interaction form in mixed electroacoustic music have to be seen necessarily as *fusion* between the acoustic and electroacoustic sound universes?

We thus verify that if prejudice is made present through thinking that is exclusively in favour of interaction in real time, it changes its character and becomes also a presence in the essence of thinking that decrees the end of the acoustic instruments.

In general, the critique of the followers of pure electroacoustic music is orientated by the irrevocable need, in the case of using instruments together with preelaborated sounds in the studio, of an absolute fusion between instrumental writing and electroacoustic sounds, assuming therefore the presumable impossibility of such intrinsic correlation and declaring as impractical any interaction. To tell the truth, such criticism is derived from musicians that, in spite of their gifts in the electroacoustic elaboration in the studio, had little or no experience at all with musical *notation* and with the more abstract procedures that are previous even to the coming of concrete music. Such abstract procedures are typical of what is commonly designated as musical *writing*, a concept which is indispensable to all and any consistent musical poetics, from that which is nearest to instruments and most disentangled from any technology to that which is purely acousmatic.[4] It is only right to argue that, in the mixed elaboration, the composer will obtain better results if he/she constitutes an organism in which the instrumental as well as the electroacoustic articulations are not completely divorced from one another, as if he/she were dealing – at least during the whole time of the composition – with two plans totally independent from each other and which are, as a matter of contingency, running in a concomitant way. Obviously, structural interdependence and even relative autonomy do not implicate the absence of correlation between the different levels of musical writing (instrumental and electroacoustic). But in the same way as the critique concerning an assumed impossibility of interest for the musical structures 'fixed' on a medium is much more due to an incapacity of its partisans in elaborating, in an effective way, electroacoustic 'writing' in the studio, the opinion concerning a presumable impossibility of a *real* interaction between instrumental writing and electroacoustic sounds lapses, let us verify, of a clear limitation on the part of the musicians that decree it in face of the instrumental writing itself.

Here is, consequently, one of the most current deformations of structural thought in music since the coming of electroacoustic composition. Having made a substantial mutation in the concept of proper *musical material*, which passes, besides its *relational* character (common in instrumental music), to acquire also *constitutive* characteristics (spectral constitution, sound sources), electroacoustic music extends the ambit of the appointed functions by Schoenberg. If *fusion* constitutes an indispensable unifying element to mixed musical organisation, the *contrast* between both sound worlds is equally essential to the discourse and the course of the composition! It is in this sense that, in one of the texts that compose my aesthetic theory on electroacoustic music, I insisted on both factors as fundamental elements in the interaction between instrumental writing and electroacoustic resources (cf. Menezes 1998b).

4. DOMINANT FUNCTION

The indispensable mastership of both aesthetic spheres of the mixed composition – instrumental and electroacoustic – will not, thus, ever limit itself to the phenomenon that, in an exclusive way, merges and identifies them. On the contrary, it will be strategically necessary that, in certain moments, the *contrast* between both acoustic levels captures perception so that their *fusion* can be appreciated properly.[5] No matter how much of the *dominance* of a given *function* (*unifying* in fusion; *articulating* in contrast, speaking according to Schoenberg) is made present in a certain work, the compositional strategy is relentlessly nurtured by both aspects that are subjacent to the phenomenon of interaction. In this way, I've once stated, 'it is through the old principle of binary opposition, according to which a certain element is only valued if confronted with its opponent, that fusion and contrast can be noticed as a dominant principle in a given composition' (Menezes, *op. cit.*: 15).

The Jakobsonian concept concerning *dominance* of a given linguistic function – in our case: unifying (fusion) or articulating (contrast) function – presupposes, on the other hand, the fact that we will hardly come across a sound phenomenon in mixed music, in which there is pure fusion or pure contrast, excluding its opposite. Even

[4]Referring once more to the pertinent (and poetic) thoughts of François Bayle, let us recollect, in that context, his beautiful definition of *writing* (*écriture*) as 'a manner of escaping of the time, of being able, *out-of-time*, to summarise, to organise, to imagine, to fix something that, soon after, will be reinserted in the time, in a time of performance (*jeu*)'. It is in this sense that, even amid the elaboration of his acousmatic polyphonies, Bayle affirms to be necessary 'to believe on the *writing*' (Bayle 1977: 89, original emphasis).

[5]The great masters of the history of the mixed electroacoustic music have perceived this aspect of the problem. In my above-mentioned text, I've affirmed, when pointing out the role of *contrast*, that 'since the appearance of the so-called mixed electroacoustic music, as well demonstrated by the title of the work of Maderna [to which I have referred: *Musica su Due Dimensioni*, from 1952], it was obvious that it deals with two distinct *dimensions* of the musical phenomenon' (Menezes, *op. cit.*: 14, original emphasis).

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faced with the most convincing spectral fusion of the instrumental with the electroacoustic spheres, hearing will always reveal aspects of distinction between the spectral quality originating from the acoustic world and that originating from electroacoustic resources. Similarly, it will search for a minimum contact point and some spectral identification between these sound spheres amid the most radical contrast.

5. STRUCTURAL ASPECTS OF INTERACTION

It is necessary to say, however, that the phenomena concerning fusion and contrast are anchored rather in the *structural* aspects of composition than merely in the 'physical' quality of the sound emission. It is obvious that, from that point of view, there will always be an irrevocable distinction between instrumental emission and that which is produced by means of the vibration of the membrane of a loudspeaker: no matter how 'faithful' a loudspeaker is, the sound quality that all and any amplification impinges on the acoustic space, impregnating the listening with its specific 'timbre', is undeniable. Incidentally, this fact implies a general need for a discreet amplification of the acoustic instruments themselves in the case of mixed music, so that the instrumental emission can approach the electronic amplification and the distinctions due merely to the physical and consequently spatial character of the sounds be minimised.[6] Such factor concerning this kind of 'equalisation' of the quality of sound emissions will, however, never be enough for the fusion phenomenon, in the same way as an eventual technical impediment for the amplification of the instrumental sounds won't necessarily constitute an irrevocable condition for an unavoidable contrast between both acoustic spheres (although, technically, the imbalance originating from the absence of amplification can, in certain circumstances, doubtless favour such distinction between the instrumental and electronic emissions).

Concerning the eminently *structural* aspect of the composition, the extreme conditions of fusion and contrast presuppose – unlike what would be the case if they depended exclusively on their emission quality – an entire possible range of intermediate, *transitional* situations, in which what was merged little by little is distinguished or, on the other hand, what was contrasting is gradually fusing and is dissolved in a third thing, the fruit of the embryonic intersection of the instrumental with the electroacoustic sphere. And, in that context, I boldly say that a mixed composition of great value will be one in which not only both extremities of that chain are constituent elements of its structuring, but also, in an effective way, the systematic exploration of these *transitional* stages between the fusion and the contrast.[7]

In order to explore all those stages, it is necessary that the composer acquires full conscience of what characterises, in essence, fusion as well as contrast, gaining also knowledge concerning the transitional possibilities from one to the other of those extremes. It is in this that resides, in synthesis, what can be called a *morphology of interaction*.

What are thus the characteristics of fusion and contrast, and what are the possibilities of structural transition between these two poles?

6. THE ESSENCE OF FUSION AND CONSTRAST

In order to achieve fusion between the instrumental writing and the electroacoustic structures, it will be necessary to make certain *located transfers* of spectral characteristics from one sound sphere to the other.[8] What merges with another thing, does it by way of an *absolute similarity* with this other thing, of at least one aspect of its constitution. In this sense, dealing with electroacoustic sounds which are pre-elaborated in the studio, the choice of the constitutive material of departure (sound source) acquires great relevance: it will be more plausible to work, on support media, with sounds originating from the proper instruments used in the composition rather than with disparate sounds coming from other sources, without any related origin to the physical materiality of the employed acoustic instruments. Although the transformations of course can be very drastic, the use of similar constitutive material causes a certain preponderance of fusion by conserving some of the energy profile that checks identity to the resulting sound textures.

But such a strategy is far away from being exclusive: the structural transfers can lean on other aspects than the colouration (timbre) of the spectra, such as identities related to frequencies, space routes, behaviour of melodic and mass profiles, gesture-like constitution of sounds (which can be identified even through the treatment to which they were submitted). In other words, although it is more suitable, concerning fusion, to work with the proper instrumental sources for the elaboration

[6]Unless a radical contrast is longed for, in which case the distinction in sound emission is also planned by the composer in spaces where an amplification of the instruments should be necessary to minimise the difference between the sound quality of the acoustic sphere and that coming from the loudspeakers.

[7]From this point of view, the *harmonic aspect* of composition or simply *harmony* – in its vaster meaning, from the interval structuring to the spectral constitution of timbres – can, in my opinion, be seen as the main tool of composition for the elaboration of such transitional aspects as much as of the extreme situations of that chain, going from fusion to contrast and vice-versa. It is already in this sense that I have been developing, from the mid 1980s, two specific harmonic techniques, with which I elaborate most of the structures of my compositions: the *cyclical modules* and the *proportional projections*. (Concerning such techniques or methods, please see Menezes 1998a: 70–4, 85–92; Menezes 2002; and in English: Menezes 1997).

[8]In my earlier text on fusion and contrast, I had already defined the fusion as the stage in which 'one deals with a ''transfer'' of certain sound characteristics from a sound sphere to the other' (Menezes 1998b: 15).

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of the electroacoustic sounds, the use of other sound sources does not necessarily implicate impossibility of fusion and can, on the contrary, make more effective the transition that goes from the merged to the more contrasted sounds. It will be, therefore, through such a *relative distinction* – just possible, in the case of using the same instrumental sound source in the elaboration of the electroacoustic sounds, after countless procedures of transformation of the departure material – that the construction of an entire estrangement range will become possible, until the most evident contrast is reached (with absence of any spectral transfer).

Anyway, in fusion, a *doubt* condition is established. To a certain extent, fusion implicates wilfully, on the composer's part, *confusion* for the listener. As I have said at the conclusion of my aesthetic theory on electroacoustic music when referring to my own mixed compositions, 'the listener relapses in constant doubts concerning the nature of what he/she is listening to: if it is coming from the acoustic instrument or from the electroacoustic diffusion, if the instrumental writing is dynamically operated through spatial, harmonic, timbric and temporal interference or if the listening is being, in face of pre-elaborated structures in the studio, derived from the employed acoustic instruments or at least correlated to these sources' (Menezes 1998a: 100). In relation to the sound provenance, the more 'confused' the listener is in face of what he/she hears, the more he/she will feel the constitutive parts of a mixed piece as really integrated; the 'two plans', which are – for the critics of mixed music – presumably independent and united just for contingency, become noticed as *a unique plan*, essentially *diagonal* to the strict lines of instrumental emission and of purely electroacoustic sound diffusion; the instrumental emission rises then to be potentially projected in the acoustic space through the electronic resources. Although in no way hegemonic, this *doubt state* transpires as a supreme moment of interaction.

The contrast, in turn, is anchored above all in difference and in *absolute distinction*. In its more accentuated moments, it causes either the instrumental or the electroacoustic sphere to assume the structural role of the silence, or, on the contrary, to acquire temporal and even excluding autonomy in relationship to the other sonic level. In this sense, it makes it possible for the electroacoustic structures – unlike what happens with works based exclusively on *live-electronics* – to take off towards the trip of structural self-sufficiency. Such extreme moments constitute the soloist parts either of the instrumental writing – generally common in mixed music in its several genres – or of the electroacoustic structures – practically unthinkable in the poetics that are limited exclusively to live-electronic techniques. This momentary autonomy of the electroacoustic discourse may (and should!) constitute the structural elements that are strategically fundamental in mixed works that take equally into consideration the use of fixed technological support media.

7. THE MORPHOLOGY OF INTERACTION IN ITS DISTINCT TRANSITIONAL STAGES

From fusion to contrast, we deal then with *transitional stages* in which a *dynamism* of the spectral transfers governs. In *ATLAS FOLISIPELIS* (1996–7) for an oboe player (playing oboe, oboe d'amore and cor anglais), membranophonic percussion (two percussion players), quadraphonic electroacoustic sounds and live-electronics (*ad libitum*), I tried to systematise these intermediate stages between fusion and contrast. Some references to certain passages of this composition can serve us as examples of our theoretical explanation. For this purpose, I will limit the examples to the passages elaborated with oboes.

In a first passage (pages 1–2 of the score),[9] after the initial synchronised attack of bongos that happens simultaneously with the beginning of the electroacoustic sounds, a 'cloud' of granular sounds of slightly treated oboes emerges in the air, amid which the oboe player begins the performance of a figure that *interferes* with the electroacoustic texture and, soon after, merges into it while staying on the same note which results from the figurations of the electroacoustic sounds. Towards the end of this moment, the listener penetrates into a *doubt* situation concerning what he/she hears, due to the fusion between the sonic emissions, aided by frequency identity. We deal here with a case in which, at the beginning of the instrumentalist's intervention, there is no absolute contrast, but in which there is, in every way, a certain *interference* of the acoustic writing into the electroacoustic one. This interference is here *convergent* with the electroacoustic emission.

In a following moment (pp. 8–10), the oboe player executes a long passage, amid which the electroacoustic sounds cause interference with the instrumental context – again through similarity of frequencies – dynamising in quadraphonic space the sounds of instrumental origin. It deals here with a *potentialising interference*. Dealing neither with fusion nor with explicit contrast, the sounds of the oboe are heard in a different way after the emergence of the electroacoustic sounds, by virtue of being 'potentialised' in space.

In another moment (pp. 11–13), the electroacoustic sounds emerge from the instrumental context that was already established, as springing from the proper emission of the acoustic instrument and acquiring autonomous life in order to, right after, be excited by the instrumental gestures until incorporating them completely. An *emersion* of the electroacoustic level starts from the

[9]The indications of pages that follow and that are associated with such passages refer to the not-yet-published score of *ATLAS FOLISIPELIS*. The work was recorded on the CD, *Música Maximalista / Maximal Music*, Vol. 5: *Flo Menezes – Interactions*, of *Studio PANaroma* of São Paulo, and can be acquired on the Internet through the website of the Electronic Music Foundation of New York: www.emf.org

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instrumental one, followed by *excitement* of the electroacoustic by the instrumental sounds and consequently with *dilution* of the instrumental into the electroacoustic sphere. We deal here with a phenomenon of *reflexive transfer* from an acoustic level into the other: a thing is born from another, is interacted by the structure that was already established and, little by little, integrates it and annuls it in its own inflections.

After a passage of complete fusion between instrumental and electroacoustic sounds, in perfect *doubt state* concerning what one hears (pp. 15–20), the electroacoustic context sees itself *leaning* on the instrumental level: the cor anglais polarises a low frequency that serves as support to the spectral electroacoustic articulations (pp. 20–23). Without causing absolute fusion, the instrumental figures enhance and accentuate certain aspects of the electroacoustic context, without diluting themselves into it. We deal here therefore with a typical case of a *non-convergent interference* (anchored by a *relative distinction*).

Following this moment (p. 34), an inharmonic (multiphonic) instrumental oboe sound finds back-up in the electroacoustic context, which emerges gradually from the instrumental sound, polarises the texture and develops until it reaches its utmost consequence, engulfing the instrumentalist's spectrum in space. The instrumental sound is entirely dissolved into the universe of the electroacoustic sounds, which project 'outside' what had been enunciated at first by the instrumentalist. It does not deal, here, with interference, since the electroacoustic sounds appear as 'from within' the instrumental sound. We can call such a phenomenon a one-way, *non-reflexive transfer*, in that the transmutation of one sphere of sound emission to the other is almost imperceptible. When the listener is aware of what he/she is listening to, the music deals no longer with sounds originating from the instrument, but rather with electroacoustic sounds that involve him/her in quadraphonic space.

As a consequence of that moment, the electroacoustic sounds win autonomy, developing an entire texture in which there is no instrumental sound at all (pp. 34–5). We deal here with the more evident contrast – as already mentioned above – in which one of the sonic levels (in this case, the instrumental one – although it could be handled otherwise)[10] silences and does not interact with the other. Such a phenomenon goes beyond pure contrast through a *textural distinction* (that happens, in fact, in some moments of the work), consisting of what we can designate as *contrast through structural silence*.

In another moment (pp. 37–8), the instrumental context, different from the electroacoustic one and concomitant to it, refuses to be dissolved in the electroacoustic level, ultimately interfering with and determining the latter, so that the electroacoustic context gradually transmutes itself into a transformation of the acoustic sounds and instrumental gestures. We are in the face of a phenomenon of *directional contamination* of texture. The result is, anyway, a *fusional* state, but such a state occurs through a metamorphosis of one of the sound spheres which, at first, stood out sharply from its opponent through contrast.

Finally, *ATLAS FOLISIPELIS* culminates in a conclusive passage (resultant of another *non-reflexive transfer* – pp. 40–41), in which the oboe player is silent and the electroacoustic sounds, derived from oboe sounds that were used almost in an intact manner, project the instrumental sound in quadraphonic space through textures consisting sometimes of well distributed points in space, sometimes of rotating trajectories (pp. 41–3). This is a case of total *virtualisation* of the instrumental sound.[11] Such a stage, that refers the listening equally to a doubt state due to the total spectral identity of the sounds, surpasses the proper limit of the *fusion through textural similarity* (in which the reciprocity of spectral transfers annuls a categorical distinction of what is instrumental from what is electroacoustic). In doing so, it actually constitutes an opposition to the most evident contrast that is caused through the silence of one of the sound spheres, concomitant to the differentiated action of the other. The difference between both stages of structural silence of one of the compositional parts is given exactly by the radical approach of the electroacoustic texture in relation to the instrumental performance. If in the case of *contrast through structural silence* either the electroacoustic part or the instrumental one is silent, in the case of *fusion through virtualisation* the instrumental writing silences, against an implacable approach to the instruments and instrumental *simulation* on the part of the electroacoustic context.

The figure explains the directional net going from the most obvious contrast to the most complete fusion between the instrumental and the electroacoustic contexts.

8. INTERACTIVE CONCLUSION

Far from the pretension of being exhaustive, the present approach is not definitive and does not constitute more than an invitation to an 'interactive' and maybe collective reflection, on the part of the international community of electroacoustic music, about the rich and inexhaustible questions concerning the phenomenon of interaction.

Possibly, such discussion will not achieve a larger consensus than that developed around spectromorphology, as described initially by Schaeffer and thereafter by Smalley. Not even its understanding on the part of the

[10]This is also the case in the passage of pp. 25–34, which precedes the moment of *non-reflexive transfer* of pp. 34–5. In this passage, the cor anglais and the two percussion players act without any concomitant electroacoustic texture.

[11]In the score of the work, I even named such passage as 'virtual oboe'.

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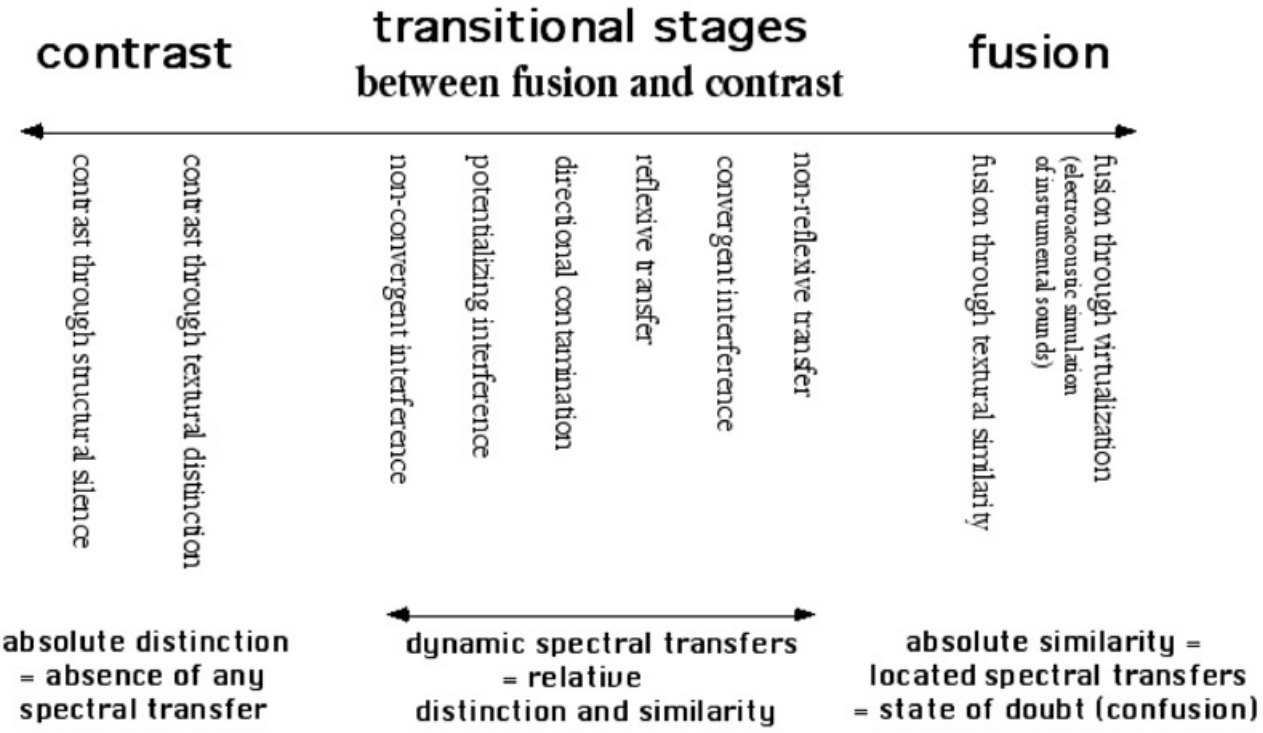


Figure 1. The morphology of interaction.

electroacoustic composer will result, necessarily, in the use of its terminology or in effective determination of the compositional strategies put in practice in the act of composition in the studio. In the same way as the composer can make use of, or entirely give up, notions related to sound grain, flotation (*allure*), etc., while composing – although he/she may be in the face of grains and flotation – nothing guarantees that the awareness of such transitional stages between the most evident contrast and the purest fusion becomes decisive in his/her pragmatic action in the moment of the realisation of his/her mixed composition.

Nevertheless, in the same way as the exercise of musical knowledge is carried out by means of the continuous accumulation of information and techniques, as well as through an increasingly stronger awareness of the phenomena with which one deals in composition, I believe that such discussion, even if in an indirect way, will contribute substantially to an improvement of the practices that see in the phenomenon of interaction between instrumental and electroacoustic writings one of the points of largest interest in contemporary music.

São Paulo, February 2001

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