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ANCONA

AMI
UNIVERSITÀ DI ANCONA
ISELQUI

A cura di

GOFFREDO HANS
GIANNI ORLANDI

LISTA DEI PARTECIPANTI

1) AVIO GEMMA
2) BOLOGNESI TOMMASO
3) BORGONOVO A.
4) BOSETTO ANTONIO
5) BRESCIA MAURO
6) BRIOSCHI FABIO
7) CAMILLERI LELIO
8) CAPPIELLO CARMELO
9) CANANZI ANSELMO
10) CAPELLI CARLO
11) CENA MECHI
12) CORGHI AZIO
13) COSTANTINI CLAUDIO
14) COTEMI PAOLO
15) DANTI PAOLO
16) DASHOW JAMES
17) DE BERARDINIS PIERO
18) DE DUCA L.M.
19) DE POLI GIOVANNI
20) DI GIUGNO GIUSEPPE
21) DOATI ROBERTO
22) DONATO GIUSEPPE
23) DORO ANTONIO
24) ESCOT POZZI
25) FAGARAZZI BRUNO
26) FALCONI ROBERTO
27) FRIGO LUCIANO
28) GABRIELLI SANDRO
29) GALANTE F.
30) GIACCAGLINI GIANNI
31) GIANSANTI ANDREA
32) GIORDANO AURELIO
33) GROSSI PIETRO
34) GUARINO EUGENIO
35) HAUS GOFFREDO
36) LISI RICCARDO
37) LORRAIN DENIS
38) LUPONE MICHELANGELO
39) MACHOVER TOD
40) MALCANGI MARIO
41) MARI MICHELANGELO
42) MARTINEZ JORGE
43) MC ADAMS STEVE
44) MELZI GIOVANNI
45) MENZIETTI PAOLO
46) MIAN ANTONIO
47) MICHI FRANCESCO
48) MOSCARDI ENRICO
49) NOTTOLI GIORGIO
50) OZZOLA VITO
51) PERUZZI LUCIANO
52) PETRARCA S.
53) PEZZANI ENZO
54) PIAZZALUNGA MARCO
55) PICCININO MAURIZIO
56) PINI ALESSANDRO
57) POPE STEPHEN
58) POZZATI VITTORIO
59) RAMPAZZI SERENA
60) RAZZI FAUSTO
61) RIZZI MAURIZIO
62) RUBBAZZER M.
63) SANI N.
64) SAPIR SYLVIANE
65) SGARGI MASSIMO
66) SICA GIANCARLO
67) SINIGAGLIA TIZIANO
68) STROPPA MARCO
69) TAMBURINI SERENA
70) TEDDE GIORGIO
71) TISATO GRAZIANO
72) TRUDU ANTONIO
73) VIDOLIN ALVISE
74) WESSEL DAVID

IDEAS ABOUT TIMBRE AND COMPOSITION

Tod Machover

Stephen McAdams

Xavier Rodet

Marco Stroppa

David Wessel

IRCAM - 31, rue St. Merri - 75004 PARIS (FRANCE)

General Statement of Purpose

The present project is motivated by the belief that TIMBRE is a musical element which has been traditionally neglected in Western music, and which, in a sense, has "come into its own" during this century. The quick development of certain tools and concepts in the last few years leads us to believe that we have only scratched the surface in the way that an innovative concept of timbre might change our ideas about composing, performing and listening to music.

We believe that the time has come to consolidate our knowledge in this area, to combine scientific tools and musical concepts in a research team environment, to encourage directed experiment and exploration with timbral materials, and to propose methods that seem most likely to favor a constantly growing base of knowledge which would be useful and easily accessible to others. We acknowledge that, of course, many of these questions have already been addressed by others, notably by the CHANT/FORMES group, and that a good quantity of these ideas may be found in the papers that this group presented at the last two International Computer Music Conferences (Denton 1981, Venice 1982).

The present proposal describes the main areas of this research project and should serve as a basis for general discussion. **The purpose is to set up an open environment to be participated in by the whole IRCAM community.**

I. Goals

A. *Rethink the importance of timbre* in a musical context. It is equally pertinent to explore how timbral structures relate to each other, and how timbre in general relates to all other musical elements.

B. *Develop sophisticated work tools* for composer and researcher, rather than a constrictive musical theory of timbre. The idea is not to define "timbre", but to enable exploration and control of musically important aspects of timbre.

C. *Include psychoacoustic principles* in a work environment; this provides both a way of testing and improving scientific ideas and of applying them in a direct way for musical exploration.

D. Make high-level adaptation of *existing programs and tools* - instead of starting from zero - to facilitate work for everybody.

II. General Categories to be Addressed

A. An Environment of Technical and Conceptual Tools

1. EDITING TOOLS: to provide a statement of what we need from and intend to contribute to the development of an intelligent, composer-friendly editing environment. The first stage of such development would involve a study of various tools already available (MIT, Buxton, Stanford, etc.) that might be used as whole or partial systems, or be adapted to our own needs. At this fundamental level we seek to define, evaluate, change, combine, classify and perfect timbral objects. To be specific this involves the following needs:

   a. *Visual and auditory feedback are essential.* It is very important to have an excellent graphic representation of timbral objects and structures; it is most likely that a variety of interchangeable representations would be useful. Since our work method is to be based on auditory experience, it is indispensible to be able to compare a visual representation with a sonic result at any moment.

   b. *Symbolisation at multiple levels of detail* (naming of processes, objects, qualities, etc.) would allow timbral structures to be referred to or called upon in all their complexity (worrying only about details that are essential for the present operation) at a later stage in the composition or research effort. It would be important to be able to represent an ensemble of objects that operate as a unit in the form of a conglomerate.

   c. *Need for ZOOM capabilities* - our work process implies the ability to move from a global representation to another level, more appropriate to a particular modification or description, in a homogeneous

and flexible way. Selective modification of objects would then be stored in an easily accessible form.

2. PSYCHOACOUSTIC TOOLS: we would implement programs that allow sorting and comparing of a variety of timbral data (to the extent to which this is predictable), according to psychoacoustic principles. This implies further development and extension of existing models of the auditory transform or "internal spectrum" of the mind's ear. The goal is to use clear, but not rigid, aids to facilitate the organisation of and sensitivity to basic materials. These aids would constitute a simulation of certain aspects of the human ear; they would be in a constant state of evolution and could, in any case, be amended, refined, or "personalized" by a particular user.

   a. *Loudness estimation* and comparison, construction of "running" loudness estimators so that such things as crescendos of unfamiliar sound structures can be quickly developed with perceptually relevant control parameters and then stored. We need to further develop notions of the apparent loudness invariance of sound structures in different musical contexts.

   b. *Pitch estimation*: number, strength, identity, clarity of pitch content of complex, inharmonic sounds. Programs for finding patterns of pitch relations among groups of inharmonic spectra: attempts to classify and group inharmonic spectra accordingly.

c. Develop a catalogue of *"subjective" timbral attributes* (brightness, roughness, attack quality, density, perceptual onset time, etc.) that aid in the intuitive manipulation of sound material.

d. Conceive algorithms that indicate the potential perceptual organisations of sequential and simultaneous sound structures. Such procedures would involve the implementation of existing *"grouping" principles* such as those derived from Gestalt psychology and more recent work. We would hope that such procedures would reflect the complex and polyvalent nature of grouping within a given musical context.

3. "ARTIFICIALLY-INTELLIGENT" TOOLS - The goal is to let the user benefit from the power of high-level description afforded when many details (of timbral description and evolution) are defined automatically by general programs. Again, we emphasize that an important part of such an environment is the ability of a user to contradict or modify any of these procedures at any point in the work process, and to work, if desired, at any level of detail. This implies a great flexibility between automated and manual operations.

a. A *covariance* (coupling) of parameters needs to be defined by general rules of behavior. At this level, the modification of any high-level parameter has a direct and automatic influence on the re-adjustment of all other parameters in a particular sound "object".

b. *Defaults*: the musical and acoustic knowledge base that we propose to encourage implies the continual acquisition of default values and controls for the maximum number of definable sound elements. These defaults describe a "normal" behavior of a particular object, and are, of course, changeable at any time.

c. Rules for *internal evolution* of sounds: any complex sound structure (using any synthesis model) involves highly intricate variation over time of that sound's internal components. In most cases, a pre-established set of relationships between different partials (perhaps definable by clear and simple algorithms) would preserve sufficient richness of timbral evolution without requiring unnecessary data specification by the user.

4. GESTURAL INPUT DEVICES - Considerable discussion has taken place recently about the need for more sophisticated gestural input devices at IRCAM. We feel that the demands of timbral control might imply a different design for such devices than those that have been proposed so far. Although discrete controls will always be necessary, a flexible system for measuring *continuous* changes in pressure and position needs to be developed because it is most likely that complicated transitions and transformations of timbre will operate in this way and could be delicately controlled at a performance level. Besides more obvious "instruments" that have already been discussed (string simulators, track balls, spatial indicators, etc.), we propose reflection about a more radical concept that seems particularly well suited to this work: a three-dimensional timbral surface that would be sensitive to the touch, and

could either allow one to sculpt a static timbral object, or to influence the evolution over time of timbral transformations. The outputs of such input devices should be neutral in format and applicable at any level of the synthesis process.

B. An Environment of Musical Tools

This part of the project is, perhaps, the heart of the matter and is, at the same time, both the most "musical" and the most personal/subjective aspect. The goal is to allow musicians to express their ideas in the most musically intuitive way. In our minds this implies, by definition, the gradual development of firmer concepts of timbral description and organisation (on a musical level) than are presently available.

1. *Timbral library*: As part of the knowledge base that we propose to develop, we need to build a library of data describing a wide range of timbral objects, both those that resemble physical sounds and those that are more synthetic. The importance of such a library is that the user could call any of these timbres at a given moment, compare, transform and create transitions between them since they would be stored in a similar format.

2. *Context sensitivity*: Since music is an art of TIME, timbral objects are meaningless before they are given a musical context. As much as possible, we hope to develop a means of investing a certain amount of sensitivity to context in our timbral objects so that, for instance, this object would automatically adjust its behavior depending on past and future events, and on other musical elements present at a given time.

3. *Organisation*: Our tools should make it as easy as possible to compare timbral objects and processes, to define musically structural relationships between them, and to manipulate and organize our materials based on these functional decisions.

4. *Transitions*: Perhaps the most important aspect of this work is the ability to describe the way timbre changes and evolves over time. At present, our conceptual descriptions of such transitions are rather crude, and much experience needs to be gained in this area before general principles can be included in our working environment.

5. *Abstract notation*: Musical notation is important not only because it allows musicians to communicate with the outside world in a highly efficient way, but also because such notation already implies a high degree of conceptualisation and understanding of a musical system (and, of course, of musical materials). It seems equally desirable to have such a notation to input timbral information to a machine (or for that matter, express it to performers), as to have a musical representation produced by the machine itself. We see no reason why these two notations (input and output) should not be identical, or at least compatible; in addition, we feel that much of our experience with traditional musical notation can help in developing such a new notation, perhaps in a more direct way than had been imagined. (We see no reason why the output representation from a machine must or should be similar to that machine's internal representation.)

Concluding Remarks

We believe strongly that all work on timbre should originate with musical ideas, and not with constraints that are implied by a specific synthesis model or system. In fact, our goal would be to produce a system that would be completely transparent to (and would actually ignore) the particular synthesis model needed for a particular application. Eventually we would imagine an automatic choice of synthesis resources being made by the computer to produce the most correlation with a given timbral description. It is clear that all available synthesis models will find a place in our research, and that we may find the need at some point to explore new algorithms (such as physical models which have proved promising in some contexts).

We also feel the necessity of using additive synthesis for certain operations. This synthesis method allows the most careful control over individual partials, which is indispensible for much of the research and music that we envision. We will develop a powerful additive synthesis model that will be easier to use than those that are presently available. It is important that the model be capable of dynamically allocating memory and computational resources since this has always been the downfall of additive synthesis procedures in the past.

As mentionned at the beginning of this proposal, our desire is to use and adapt as many tools as are presently available. It is clear that FORMES is an environment in which to create a large part of the system that we describe, and we hope to use it as much as possible.

Several musical concepts which are already under study that we find especially promising and worthy of concerted exploration in the future are : music structures that use complex spectra as the main unifying and material-generating aspect of a composition ; spectral fusion as a means of articulating the relationship between

unity and mulitplicity of any sonic structure , a musical way of describing the organic pitch-timbre-noise continuum ; and new concepts of form that use timbre as a structural element rather than an ornament.

We emphasize again that we seek to establish an attractive environment for timbral exploration, based on the conviction that composers and scientists should spend their time listening, evaluating, and choosing on a rather sophisticated level. As we said before, although our tools will be developed around a computer environment, the goal is to deal with general musical questions which have applications in all musical domains.

Although many of the proposals presented here are specific to timbre research, we are aware that many aspects are of a more general nature and hope that these will be considered in discussions for a composer-researcher work environment at IRCAM.

May 23, 1983