

Computer-based musical instruments for disabled performers

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Abstract

Presentation of a performance project in collaboration with disabled people. Beyond the technological problem our concern are the artistic choices made through the outcome of unconventional physical gestures combined with the use of computer-based instruments.

1 Introduction

"Un Bon Moment" is an artistic project which has been going on for about five years, with the participation of four people with limited gestural faculties. This work is in continual development.

Its particularity is that of closely linking the technological realisation with the artistic problems and the special conditions of the handicap itself.

In fact, rather than setting ourselves a target leading to a conventional situation (e.g. 'playing music'), and of imagining with the handicapped people the necessary technological methods with this target in view, (of course in the majority of cases this situation is specific to the able-bodied population), we preferred to start from scratch. We did not wish to give ourselves a particular goal as to the final form, but by a patient work of development and awareness create visual, sound and technological methods that would shape the rather indefinable realisation (neither show nor installation) that we have called "Un Bon Moment, A Sound and Vision Walk About ". (The term 'A Walk About': for the Australian Aboriginals this denotes a short informal holiday period, far from work, when they can wander through the bush, visit relations, or go back to native life.)

We have worked on the principle that it is the framework or the a priori concerning the results which create the handicap rather than the person himself (if one considers him as such). For example, it is evident that musical instruments as we know them are all made with reference to certain gestural possibilities (movements and space between the arms, hands and fingers, the speed and precision of these movements etc.). Even if the apprenticeship is long, for an able-bodied person it is always possible. This is not the case for "someone with a handicap", who will neither necessarily find the characteristics of his body (size, space, force and precision...) in the

instruments, nor in the music that has been composed with or for these instruments.

We no longer talked of ' handicap' when we had this consideration in mind, but rather of the particular gestural possibilities in the creation of sound equipment etc., and , more generally, of the particular conditions in the elaboration of the artistic side of things.

To define in a few words what has been a permanent feature of this project, we could say that it is not only a question of "giving handicapped people access" to music, which in the long run relies on the instrumental capacities of an able-bodied person, but rather of being aware of musical models linked to limited gestural possibilities and to tackle a relationship with musicality which does not depend on virtuosity.

2 The problem of time in "Un Bon Moment".

One of the first observations made during this project, concerned a completely unusual relationship with time .

Firstly, the time to communicate (linked to difficulties in articulating the sounds of language), and therefore the time to work together, for example, an idea and its' expression, or perhaps a decision (that of accomplishing a gesture for example) and the moment that the decision takes shape.

Secondly, following on from these first remarks, the absolute impossibility of synchronising the sound events in a fixed, predetermined manner, and therefore the impossibility of planning a musical score in its usual way.

Lastly, and in a very much more abstract sense, time as an interior rhythm, underlined by music through beat, figure, gesture, movement, because one can imagine that the apprehension of time for

someone who only moves in a wheelchair (since birth), and who can only talk (very few words at a time) in an extreme state of tension, must be very different to that of an able-bodied person.

Certainly it seemed essential to us that we not only take into account these particular temporal aptitudes, but also that we bring them to the fore :

- **when creating the instruments. :** each instrument was made with the previous remarks in view, with the aim of enabling the musician to physically involve himself (taking into consideration the gestural particularities, movement, energy, muscular tension etc.) in the invention of sound processes.
- **In realising the performances :** we worked to create situations and potential rather than the sound result itself (sound, visual, gestural possibilities for each musician, and possibilities of reunions and play for several people).

We also aimed to offer the spectator this idea of a 'walk about', where there was no longer a question of coherence through the idea of shape,

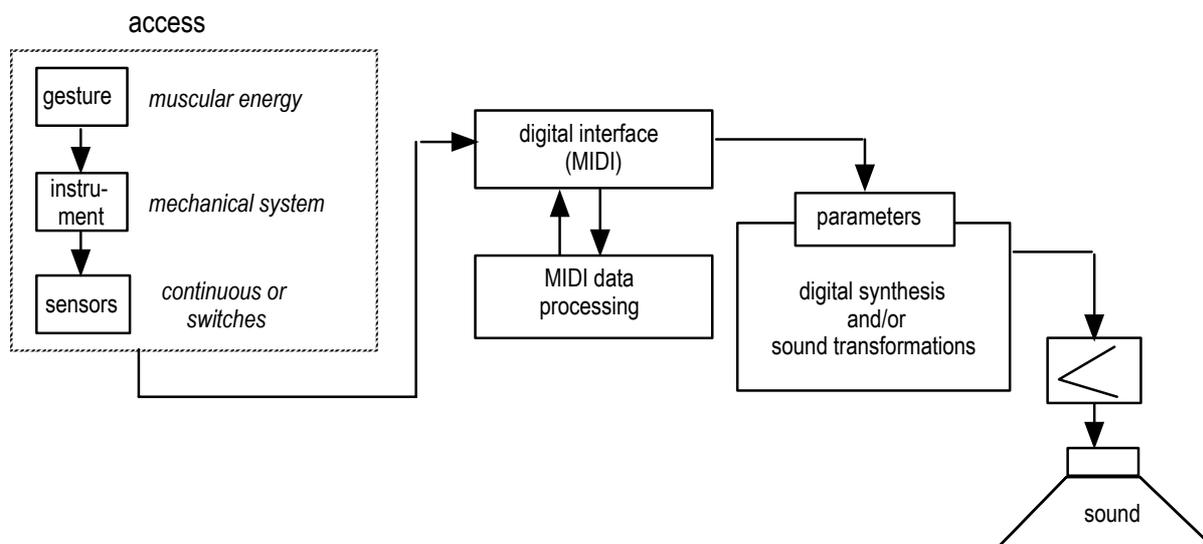
but rather of an awareness of events that were about to happen in a space of time that belonged to the spectator himself, as he could go in and out of the performance area as he wished.

3 The electronic instrument.

The particularity of an electronic musical instrument (which does not appear in mass made instruments which are often made with the concern of imitating acoustic instruments), lies precisely in the absence of an acoustic mechanism system, closely linking a certain type of gesture with a certain type of sound (the instrumental tone). So, a musician has to learn to play the instrument, that is to say that he has to master a certain gestural repertoire that enables him to produce the sounds of the instrument and to tackle its musical range.

The problem of the electronic instrument depends to a certain extent on how much the different stages of monitoring of the sound phenomena are left in the hands of the user/creator.

Between gesture and sound, one does not necessarily manipulate masses in movement (hammer, air column, string...) but rather digital data . The following diagram explains the different entry and control points.



This conception of the instrument has the effect of separating gesture and sound transmission in their immediate (conventional) relationship, and this implies of course the need to invent new relationships between gesture, sound and musical creation.

The consequences of this, seem to us :

- to permit new musical gestures outside the realm of conventional musical attitudes.
- to permit the invention of other forms of musical script, linked to imprecision and approximation.

- to show the need of a reflection on musical choices simultaneously with the creation of instrumental devices. And, in a certain way to show that in conceiving an instrument, one has already started to compose the music.

- on a more general level, beyond the opposition between acousmatic and 'live' instrumental music, it seems to us that a serious reflection on the playing of an electronic musical instrument puts forward a more fundamental aspect, 'more innovative' if you like . In that there is that possibility for the

composer-musician (and/or improviser) to intervene directly on the sounds (sound phenomena), at the very moment that these develop, last, and establish themselves. Therefore he can construct and develop an idea, a musical form, on the basis of the sensation of a duration, and of the modes of articulation, which is the converse of a structure of logic and rhetoric.

These playing techniques closely link together sound matter and musical composition, in so much as the two are generated at the same time, and evidently in a new way, question the relationships between organisation - rule- and material. Historically it is probably a little early to try to formalise these new relationships.

What one can remark however, is a certain way of creating music which implies that the work is looked upon as a living moment, whereas traditionally it is considered as a constructed object. In this perspective one can well understand that the relationship between the elements that make up the work and the work itself, are deeply modified. In fact, one can even say that following on from this idea, in certain cases, the work's sense stays the same even if it's composing elements are not quite identical.

4 The actual state of the project.

For the moment " Un Bon Moment " has led to two public performances over a fairly long period (about a month). Four mobile, autonomous instrumental devices (mobilehomes) are working : one of which is intended to record, transform and project images, and the three other devices which are more specifically intended for sound play. The three instrumental "sound " devices have been conceived on the same lines : a gestural captor, a module which transforms information given by the captor in MIDI data, and a sound generating module and a video projector which projects the whole or a part of the computer screen. The three gestural captors are:

- A HEADMOUSE (Origin Instruments) system which controls the mouse pointer on the computer screen, thanks to an optical captor which follows the movements of a disc stuck on the operator's forehead.
- A lever, large-sized (and of large range), type joy-stick.
- A breath and lip-pressure captor, which is part of the YAMAHA WX7 control system.

These three captors communicate with the MAX (cycling74) software, either directly (WX7), or via the intermediary of an I-cube (Infusion systems) (lever), or thanks to a MAX object specially created for this work: the PAD object. At the moment, the sound generating module for the three sound instruments, is supplied by the audio section of the MAX (MSP) software.

The computer screen is projected either on a surface which has been integrated into the mobile

instrumental device, or on an outside surface. It enables the visualisation of texts that are heard and treated in a sonorous manner, of images that have been transformed by MIDI data picked up by the gestural captor (Imagine software), and of the redesigned mouse pointer. (See below, Rafika Sahli-Kaddour's instrument.)

4.1 The PAD object.

This is an external object in the form of a rectangle. Like all the MAX objects, it can be moved on the patch and at the same time keep its intrinsic characteristics.

It is redimensionable with a simple click and slide of the mouse.

It analyses the movements and actions of the pointer situated in the screen zone that it covers, and sends back :

- A couple of values linked to the mouse's position relative to the lower left hand corner, both in abscissa and ordinates (an offset and a multiplying factor can also be given).
- The speed of the pointer's movement.
- The pointer's acceleration.
- A message if the pointer enters into the object.
- A message if the pointer leaves the object.
- A message if a click happens when the pointer is on the object.
- A message if the mouse button is held down when the pointer is on the object and moves (click and drag).

4.2 Rafika Sahli-Kaddour's instrument.

Rafika's gestural captor (the following of head movements) enables her (via the intermediary of the PAD object) to use three instrumental devices which all function in markedly different ways.

- **The first device** functions by projecting the computer screen on a surface or a space where visual indicators have been set up : images, objects... each of which correspond to PAD object's position which does not appear. In this way, Rafika can direct the mouse pointer (redesigned as a red circle) towards real objects in space, move it on to the objects, and produce and control the sound events according to three visual indication points, a sort of non-linear score.
- **The second device** is fairly similar to the first, apart from the fact that a computer screen image is projected (it could be a film), and the objects that allow the sound events to be controlled can then correspond to certain zones of the image or the film.
- **The third device** does not need screen projection, and uses speed information and the movement (horizontal or vertical) of the pointer, which is given by the PAD object. The instrumentalist in this case, controls the sound

transmissions by the speed and the movement of the head. The movement repertoire calls upon, for memorisation, more abstract notions of touch and intention.

5 On-going development.

In collaboration with the CNRS-LMA-S2M team from Marseille.

Using the instrument which has been developed for Rafika Sahli-Kaddour as a starting point, we think it is possible to imagine a more general instrument which could be used by anyone with so-called limited mobility.

As we have seen, the instrument is in use at the moment, and is adapted to Rafika's gestural possibilities (she can only move her head). She can set off sound events, and control sound evolution, by moving the pointer on the screen thanks to a HEADMOUSE system. We have noted that Rafika has been able to acquire a certain dexterity in using this instrument. However, if one puts oneself outside the cadre of " Un Bon Moment", the use of the device is subject to important constraints :

- the need to visualise the pointer on the screen (or its projection on an external surface).
- the obligation of rewriting the programme which detects the speed and movement of the mouse pointer for any modifications of the sound configuration.
- the need of a gestural apprenticeship linked to a special device, here it is the HEADMOUSE which in Rafika's case causes no problem at all, but which can be completely impossible for certain handicapped people.

The idea then is to conceive an instrument (practically opposite to a traditional acoustic instrument), which is neither a device that imposes a gestural form, nor a device adapted to specific morphological and motor abilities, but rather one which is in a way capable of 'learning' the instrumentalist's gestures.

It is clear that this type of instrument could be used outside the world of handicap.

As things are at the moment, we have set out three stages for the realisation of this project:

- The qualification of a certain number of gestures (few , for the moment a maximum of ten or so) which correspond with musical aims.
 - The realisation of an "apprenticeship motor", following by computer the gestures of the instrumentalist (detection of the pointer's movements and speeds).
 - The realisation of an interface which enables the complex gestures " learnt" by the computer, to be linked to the previously created lexicon, and certain gestures or types of gesture, to be linked to sound events.
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