What sounds can I do with a joystick and a tablet?

ARFIB D.
CNRS-LMA
31 Ch Joseph Aiguier
13402 Marseille
France
arfib@lma.cnrs-mrs.fr

COUTURIER J.M.
Blue Yeti
France
www.blueyeti.fr
jmc@blueyeti.fr

FILATRIAU J.J.
Communications Laboratory, UCL,
1348 Louvain-la-Neuve
Belgium
filatriau@tele.ucl.ac.be

KESSOUS L.
Tel Aviv University
Speech Language & Hearing Laboratory
Chaim Sheba Center,
Israel
Kessous@post.tau.ac.il

Abstract

The question "what sounds can I do with a joystick and a tablet?" will make us a tour in the domain of "gesture controlled audio systems". First a philosophy of the sound-gesture relationship will be evoked through the metaphors it can bring. Then the burden of linking peripherals to programs will be under the spot of "the art of digital lutherie". Finally four applications, derived from other of our home-made digital music instruments will summarize the demo we will provide.

1. Introduction

Today it is very easy to get a computer and some devices normally devoted to video games or editing programs, such as joysticks and tablets. Using them for digital music instruments is not so usual and brings many interesting questions on the spot [1].

2. Metaphors for gesture and sound

Linking gesture and sound requires to think about gesture and sound, but moreover to think about the intrinsic relation between them two. One useful way to apprehend these domains is to use metaphors.

2.1. Sonic metaphors

The sonic domain is full of metaphors, and in one sense one can say that any "solfege of sounds" is metaphoric.

But first, one should distinguish some classes of organisation. The meta-level is the one of general organisation of a piece. The meso-level is the one where one organises objects, or fluxes, in order to get some "phrasing". The micro level is where one deals with timbre evolutions, the making of sonic objects or fluxes. The focus of this paper/demo is at this micro-level, namely digital music instruments, and most of them use the spectral modification of sound sources, a metaphor strongly marked by the voice perception.

2.2. Gesture metaphors

Gestures rely on two facts: the kinestesic part is the fact that any gesture relies on the body implication in the process (it can start from the "elementary" gesture of walking to some "tai-chi" sensation of energy); the goal-oriented part is oriented on the fact that you have an intention that manifests through action, for example you want to grasp a glass to drink, or you want to write with a pencil.

When objects are held in hand, gestures are constrained by these objects. This is of course very true for joysticks and tablets, where a position of hand is conditioned by the devices themselves. A tablet is a combination of a surface and a stylet. The surface itself is quite small, especially when you want it to be cheap and portable. The stylet itself has the property that it leaves no trace on the surface, so one usually needs to look the mouse pointer onscreen to know the stylet position. However, it is possible to give gestural indications by putting a drawing under the transparent cover of the tablet surface.

Gestures on a tablet can be of different natures. Scratching is an obvious option, with the specificity that there is also an "off position" when the stylet is out of the surface. 2D free gestures can be done, such agitation, or circles, or whatever metaphor can come. A special gesture is the facility of having a short oscillation of the hand, a gesture reminiscent

to string playing on cello-like instruments. Pointing is another option, as one would do with a finger. The triggering (by putting the stylet on the surface) is very immediate as a sensation of pointing-acting. Pressing is an alternative to an on/off strategy, as the end of the stylet is pressure sensitive. The stylet has also a double switch on its body, so that push button action can arise.

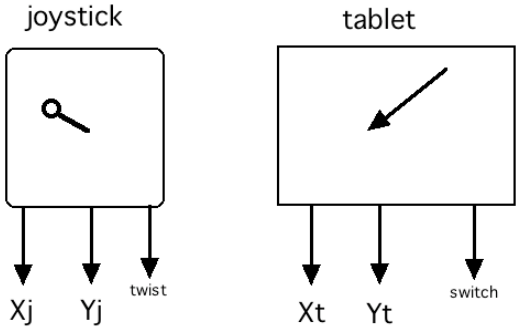

Fig 1: The joystick+tablet configuration

While a tablet is reminiscent of a traditional activity, writing, joystick is associated to video game, and the repertoire of gesture is binded by the device. One can explore a 2D space via the stick; one can twist the handle; one can "fire" using a push button action. The metaphors used by the joystick video gamer depend on the game he uses, but usually it is a combination of navigation and action, where the joystick itself moves something (either the observer or the object), the twist being an additional factor which can be very important (such as the zoom), and the firing button being the essential part of the action.

With these two peripherals (fig 1) comes the questions of bimanuality [2]: what device should I use with my preferred hand and my non preferred hand? Are my two hands independent or should I perform sequentially? Is it possible to use a complementary action in my both hands?

3. The art of digital lutherie

Now that we have seen that metaphors can be derived, or are at the initiation of gestures and sounds, it is important to see how they can be shared in a "gesture-controlled audio system", and more precisely for this article in "digital musical instruments" which are a subset of them.

One is used by daily life comportment to wait for a direct link between gestures and sound. For example the gesture of scratching a surface is linked with a "scratching noise", or hitting a surface is associated to a crashing sound. At the same time scratching a plastic material will be different from a metal one, and one can discover some limit case where scratching must be in between some borders: cello bowing is particularly sensitive to pressure and velocity, and Tibetan bowl playing requires a master in the circular scratching. In the contrary gestures such as the selection of a sound inside a data bank can result to a wide variation in sounds, with gestures that are all alike.

The idea of "ecologic gestures", or "daily life" gestures is a wide domain, quite underestimated: the machinery of kinaesthetic is functioning well, at such a point that letters writing can be a very good way to bring gestures to trigger events, though formally they are not so easy. So the association of a gestural metaphor with a sonic metaphor is quite conventional but the good combination between the two can give rise to a true art of lutherie ("instrument making"). As an example the metaphor of navigation in a timbre space is very important for new instruments, and its link with gestures conditions the well being of a new instrument player. Defining a navigation space is crucial in many developments, as well as the performing of "actions" that can be movements or switching activities.

4. Playing with small devices is playful

Here we describe some of the instruments that are derived from our previous digital music instruments by the fact that they have been adapted to a A5 tablet + joystick configuration. They are all made using a Macintosh and Max/MSP. The interface with the tablet and the joystick uses two USB ports and the software interface uses two Max objects, "hi" and "wacom". Out of these objects, one retrieves values corresponding to the coordinates of the stylet and joystick, as well as a twist value for the joystick and a pressure and switch values for the tablet. From these values, a correct mapping is done toward sound related values that influence sound synthesis in a global way. We describe here four of these configurations, each one holding some variants.

4.1. the voicer

Fig 2 The voicer in action

The voicer (fig 2) is a digital music instrument that is using a tablet and a joystick, so it is inherently designed with these peripherals [5]. The two main metaphors concerns the circularity of a musical scale, and the two-dimension articulation of vowels (fig3).
The fact that scales are circular has provided a mapping where sectors of a circle correspond to different notes. It is very intuitive, and a special care has been taken to allow a proper vibrato, this being done with the help of an angle to pitch translation that allows vibrato on a small part of a sector.

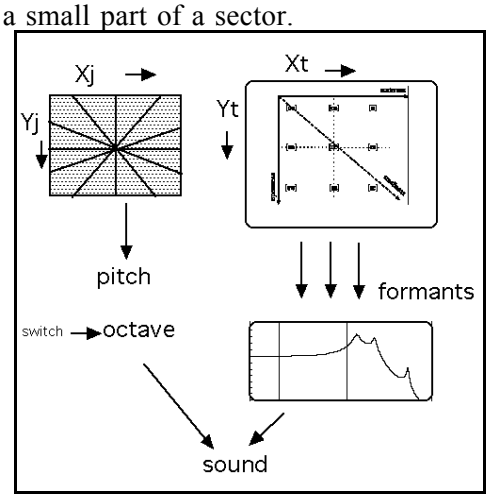

Fig 3: The mapping of the voicer

The joystick itself serves as a 2D index in a vowel map. Depending on the version of the voicer, serial filters, or parallel filters, or FOF are used to provide a vowel synthesis, but each of them include a mapping of the position of the joystick towards the values of the formant parameters. The axes of the joystick follow the openness and acuteness qualities of the vowel space.

4.2. the photosonic emulator

The original photosonic emulator emulates a photosonic analog synthesiser (fig 4), via a source filter model, where the source is a mix of different waves (the photosonic disc) and the filter is a 2D filter, which position gives the effective (and moving) filter that is used. This instrument has been widely described [3] in a form where a A3 tablet is used, where two different parts of the tablet are used with the help of a mouse (in a direct mode, X and Y being directly mapped) and a stylet.

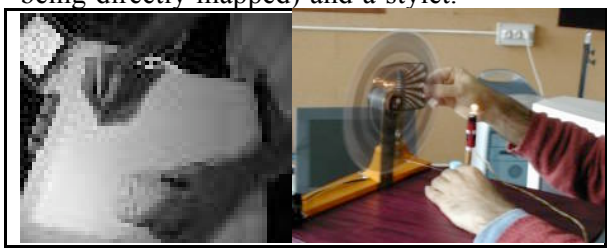

Fig 4 the photosonic emulator (left) and optical (right)

The "Joystick + tablet" is directly adapted from this emulator (fig 5). We have chosen to keep the stylet with the preferred hand on the small tablet, and to use the joystick and map its 2D values towards the mixing of the different waves, and the amplitude of a correcting potentiometer. The choice of waves ("discs" in the terminology of photosonic synthesis) an filters (eg comb or vocal filters) is the same as the emulator, and the use of the joystick requires a new learning in order to provide a kinaesthetic feeling.

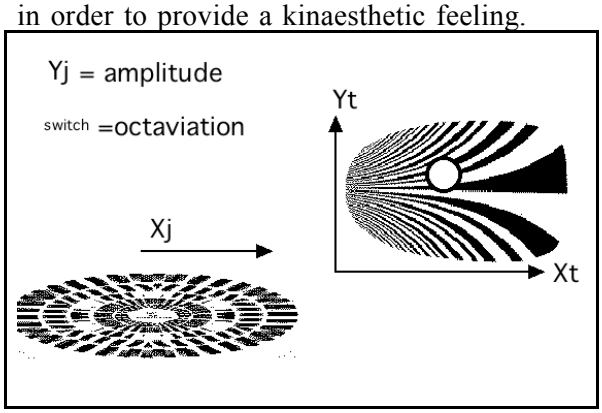

Fig 5: mapping of the photosonic emulator

4.3. A Granular instrument

This instrument consists of a granular synthesis [6] controlled with a graphical tablet and a joystick. The synthesis technique uses a sound sample that can be loaded from the computer or recorded live; the algorithm extracts some "grains" of this sample. The mapping is described in figure 6. The musician can zoom and scroll into the sound sample; this enables to use a large sound sample and to choose precisely a grain in this sample.

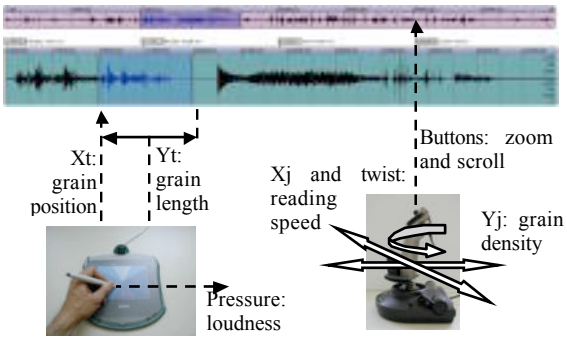

Fig 6: Graphical interface (top) and mapping of the instrument. The *twist* axis controls the reading frequency and Xj axis enables to add some random to this frequency.

The instrument was used in concert at Marseilles, in a piece for voice, harp and two digital musical instruments. The sound source of the instrument was the harp live sound.

4.4. A Texture scratcher

This instrument is an implementation of the wave-terrain synthesis, where trajectories are followed on a terrain, the elevation giving the wave of the sound [4]. In the original instrument, synthesis parameters are driven by means of a joystick and a Cintiq tablet displaying the terrain that is scanned (fig 7). A joystick+ small tablet version is also available, where the visual feedback is now on the screen and the action is on the tablet.

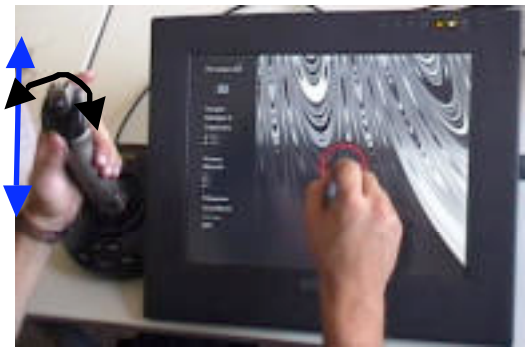

Fig 7: The texture scratcher

These two devices are assigned to different tasks in the mapping. (fig 8). The stylet is used for rapid and precise operation, such as scratching on the surface or designing a zone for the wave terrain exploration, whereas the joystick provides a parametric control to generate a trajectory cycling around a central point.

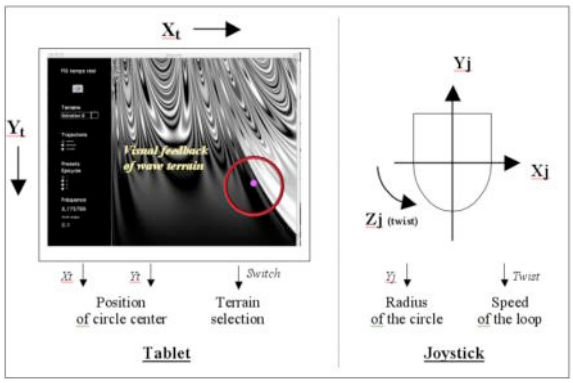

Fig 8: Mapping of the texture scratcher.

5. Conclusion

We have demonstrated that even simple devices such as a joystick and a tablet can be the source of "real instruments", providing they rely on a philosophy of gesture-sound link and a good knowledge of digital lutherie.

10. References

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