

Michaël Levinas

*Rebonds*

1993

RebondsMax6  
2014



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The setup and the execution of the electroacoustic part  
of this work requires a Computer Music Designer (Max expert).

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## Work related information

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### Performance details

- June 11, 1993, France, Paris, Maison de Radio France

Publisher : Lemoine

### Detailed staff

- flute (also piccolo, alto flute), clarinet (also E-flat clarinet), 2 pianos, violin, cello

### Realisation

- Tom Mays

### Useful links on Brahms

- [Rebonds](#) for ensemble (1992-1993), 10mn
- [Michaël Levinas](#)

## Version related information

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Documentation date: May 13, 2014

Version state: valid, validation date : June 1, 2018, update : May 6, 2021, 3:09 p.m.

## Documentalist

(pages@ircam.fr)

You noticed a mistake in this documentation or you were really happy to use it? Send us feedback!

## Realisation

- Tom Mays (Computer Music Designer)

Version length: 15 mn

Default work length: 10 mn

## Upgrade Motivation

Documentation update.

soundfiles converted from sdII to aiff.

## Comment

Not tested in concert

## Other version(s)

- [Michaël Levinas - Rebonds - portage 2020 \(April 7, 2020\)](#)
- [Michaël Levinas - Rebonds - maxmsp5-version-unttested \(April 29, 2010\)](#)
- [Michaël Levinas - Rebonds - transfert\\_mustica\\_ftp \(April 14, 2010\)](#)
- [Michaël Levinas - Rebonds - OSX Update \(Oct. 1, 2005\)](#)

## Electronic equipment list

### Computer Music Equipment

- 1 MacBook Pro - *Apple Laptops* (Apple)  
OSX 10.6.8
- 1 Max/MSP - *Max* (Cycling74)  
Tested on max 6.1.6 (not compatible with max 7)
- 1 Fireface 800 - *Sound Board* (RME)
- 1 KX 88 - *MIDI Keyboard* (Yamaha)  
Or Kurzweil PC88 [Heavy touch] [88 keys]
- 1 Footswitch / Sustain Pedal - *Footswitch / Sustain Pedal*  
optional (?)
- 1 Volume Pedal - *Volume Pedal*  
Plugged in the keyboard

### Audio Equipment

- 4 Microphone - *Microphone*  
2 for each piano (Ex.: AKG C451 or KM 140)
- 1 Amplifier - *Amplification*
- 2 Loudspeaker - *Loudspeakers*  
Stereo, in front of the audience
- 1 Mixing Console - *Mixing Console*  
4 line inputs (max dacs), 4 microphone inputs, 2 Outputs (stereo), stereo reverb

Files

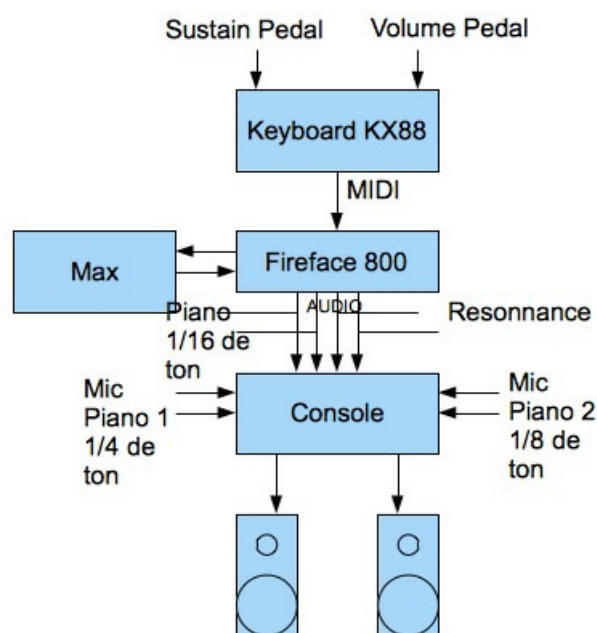
File	Type	Author(s)	Comment
<a href="#">Rebonds</a>	Score	Levinas/Lemoine	
<a href="#">Rebonds2013.dmg</a>	Patch	TomMays/Sandrine Pages	
<a href="#">Record</a>	Audio file(s)	Ensemble L'itinéraire/aeon	

## Instructions

### Quick start:

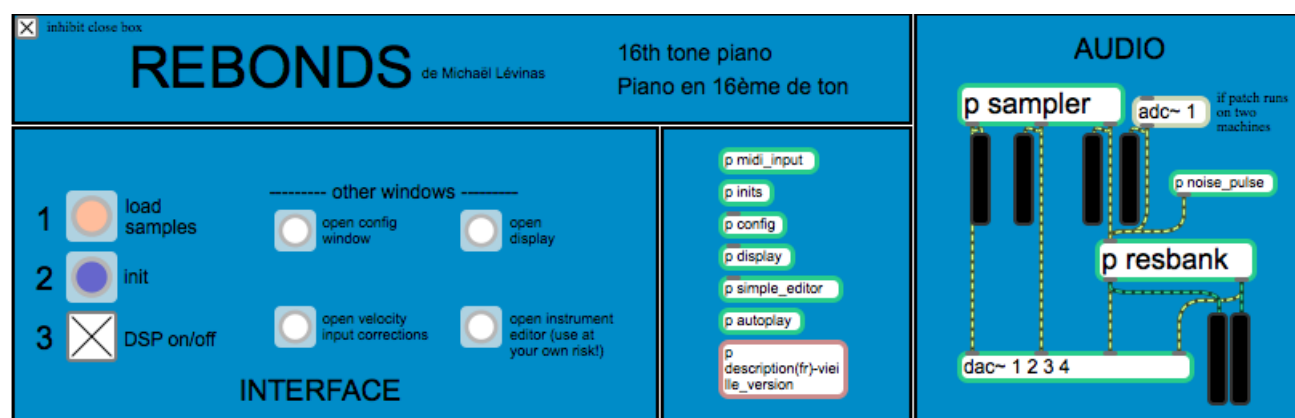
This max patch simulates a 16th-tones piano with resonators. The mix between the sampled piano and its resonances should be carefully adjusted (see the calibration and tests section below).

### AUDIO and MIDI Setup:



### Software installation

1. Download *Rebonds2013.dmg* on your computer. Open it. Copy the *Rebonds* folder in your computer.
2. Open Max 6 and choose *.../Rebonds/lib* in *Options/Files Preferences*
3. Open *Rebonds2013.maxpat*



4. Check that there is no warning in the max windows, if it's the case, correct the path in *Files Preferences*, close the patch and restart from step 2.\_.
5. Double click on *p config* and choose your audio and MIDI configuration (see below : "Patch Presentation - Audio configuration").

[config]

### AUDIO

audio driver

Driver: Core Audio

vector sizes recommended

I/O vector size: 512 128

Signal vector size: 64 128

output routing

piano left: 1 Output 1

piano right: 2 Output 2

resonance left: 3 Output 3

resonance right: 4 Output 4

input routing (when patch is run on two machines)

piano mono in: 13 Input 13

Input Device: Fireface 800 (A07)

Output Device: Fireface 800 (A07)

Overdrive: On recommended

scheduler in audio interrupt: On on

Altivec optimization: On on

CPU limit: 0 % 95

cpu usage: 7 15 peak

DSP on/off: X

sampler instrument file: 16e-inst.coll

voice stealing: ☒

\* polyphony: 40

sustain: ☒

init value: ☒

### SAMPLER

sampler output level: -3. d

sampler to resbank level: -5. d

resbank output level: -7. d

### LEVELS

Keyboard midi in switches: AU DLS Synth 1

note input: ☒

sustain pedal input: ☒

volume pedal input: ☒

bend wheel input: ☒

bend pedal input: ☒

pedal config

sustain on value (127 or 0): 127

sustain controller number: 64

volume controller number: 7

pedal2 controller number: 4

raw midi input info

pitch	vel	ctl #	ctl val	ben	chan
0	0	0	0	0	0

### RESONATORS

tuning: divisions of a semitone: 8 starting note: 60

sustain input level multiplier: 20.

no sustain input level multiplier: 1.

bank	pan A	pan B	pan C	frequency multipliers	amplitude multipliers	sustain decay rate multipliers	no-sustain decay rate multipliers	★
1	0.1	0.5	0.9	1.	1.	0.25	10.	
2				2.	1.	0.25	10.	
3				3.	1.	0.25	10.	
4				4.	1.	0.25	10.	

noise test:

noise pulse width (ms): 150

noise volume 0-127: 0

trigger noise pulse: ☐

### MIDI

Keyboard MIDI device: AU DLS Synth 1

recall user preset: ☒

store user preset: ☐

recall factory preset: ☒

revert user preset back to factory preset: ☐

init:

★ If there is not enough available cpu to run the patch, reduce polyphony and/or mute resbanks starting with #4.

press <esc> to close window

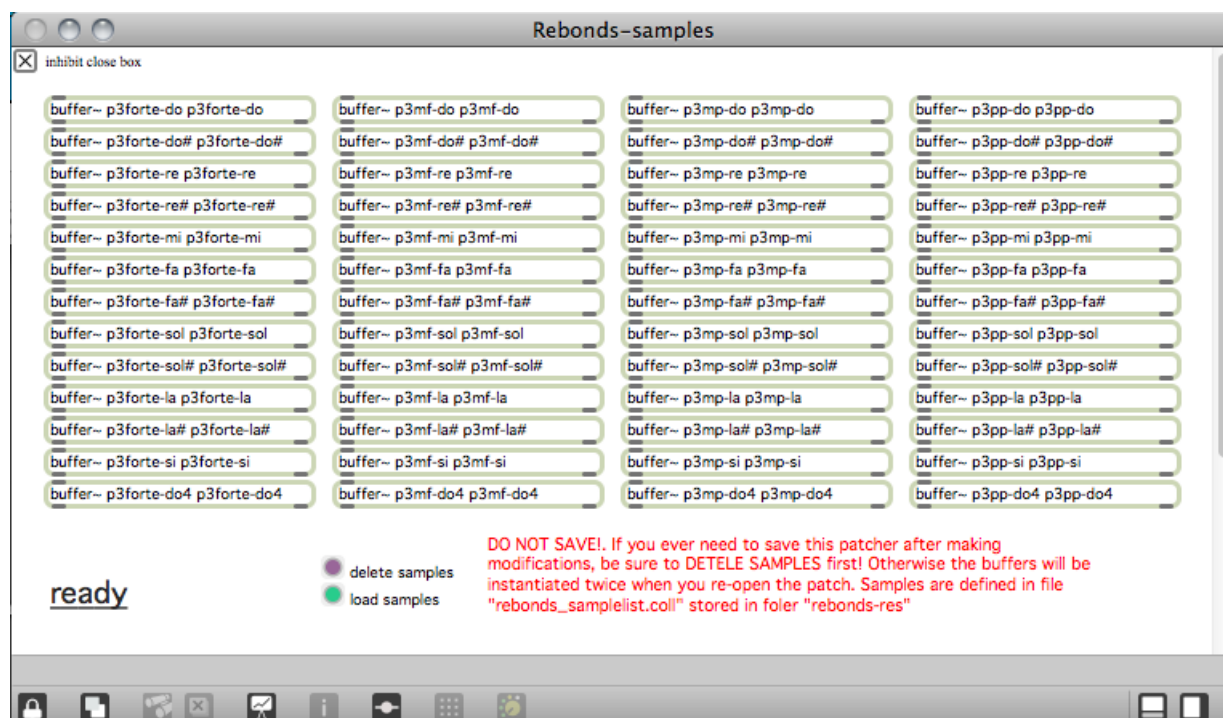
## <span style="font-size: 18px; font-weight: 500; line-height: 19px; font-family: "Helvetica Neue",Helvetica,Arial,sans-serif;">Initialization routine

When you open the patch:

1) Click on *Load samples* (to be done only once in each session)

The window *Rebonds-sample* go in front of the screen and the *buffer~* objects appear:





2. Click on *Init* on the main window
3. Click on *DSP on/off* on the main window

## System calibration and tests

### MIDI tests

After the setup process, test the MIDI input sent by keyboard to the subpatcher “Display>MIDI keyboard input display”.

Check:

- sustain pedal
- volume pedal
- program change buttons
- pitch bend controller
- keys

If you have any further problems, check the MIDI configuration in the window configuration.

Don’t forget that the keyboard should be on MIDI channel 1.

### Audio Tests

Activate the toggle DSP on/off and play some notes with the keyboard

If you notice too much latency, adjust the value of the I/O vector size option (Cf.: *Patch Presentation - Audio configuration*, below).

### Locate the piano sound in space

To make the setup easier, set the autoplay in the Interactive panel to **1** and the velocity to **70**

In the mixer device cut the volume of the resonators

The stereo image of the direct piano must be as wide as possible (low notes to the left, high notes to the right). Use pan and speaker position to give the feeling that the piano sound is coming from the KX88

The piano sound must not be “attached” to the speaker! In this diagram, the distance between the 2 speakers is used to create a wide virtual space. The main purpose is to simulate an acoustic piano mixed with the 2 other pianos

### Balance between Pianos and Resonances

1. Set the level of the resonance to a minimum **10** or **11** seconds. The effect must be heard but subtle. You should not hear a “Lost in

Space” effect ! In the Interactive panel, disable the autoplay. Play any sample from the MIDI keyboard, the sound must disappear after 7 seconds and the resonators continue for 3 or 4 seconds more. If the durations are too long or if you have the impression of hearing “Star Wars”, decrease the level of the resonances.

Staccato notes can be simulated by activating the toggle sampler/res sustain of the interactive panel.

2. The panoramic of the resonances to 180° or little more. (???)

### The 16th-tone Piano

Adjust the 16th-tone piano to balance it with the acoustic pianos

1. Set the acoustic pianos mics to have a good amplification in the speakers used by the 16th-tone piano. Use similar pan.
2. Play the 16th-tone piano with the other; then with the two pianos simultaneously. At the same time, set the direct piano output equalizer parameters to produce a “spatial and timbral/harmonic” mix. Play especially tremolo, sostenuto around the F (middle of the 1/16 of a tone piano)
3. Adjust the location of the speakers and the panoramics if necessary

### Adjustment of the resonances parameters

If the sound of the resonances is too poor, you can change them. Open the sub-patcher config>RESONATORS

To save the modifications, click on the button “store user preset” in the part RESONATORS - presets

### Quick test - Playing the Piece:

After the initialization routine:

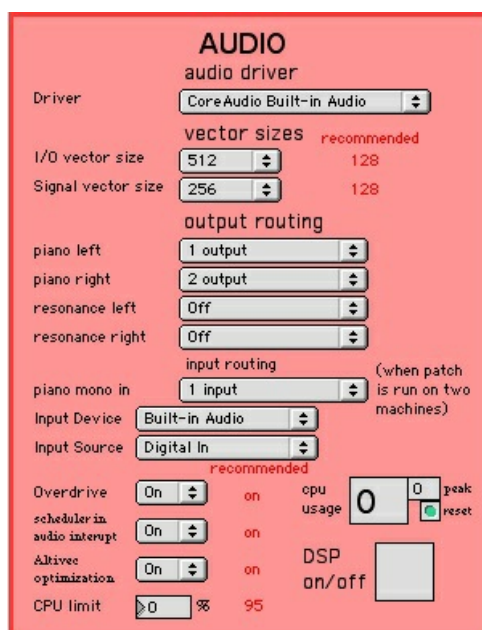
- press any note on the keyboard. If the signal is sent to the mixing consol, that means it works.
- test the pedal
- The patch is ready !

## Patch presentation ( Tom Mays )

### Patch presentation - Audio Configuration

- The menu Driver allows you to choose the appropriate sound board driver
- Set I/O vector size to 128. If you hear some clicks, increase the value to 256 or 512 (the higher the value, the bigger the latency)
- Set Signal vector size to 128
- Output routing: choose in the menu the physical outputs for each channel (piano left, piano right, resonance left, resonance right)
- Piano mono in allows you to receive the sound of an other piano sent by another computer. (Use it only if you a configuration with 2 computers)
- Prioritize MIDI: During the tests, this option gives better results when it is set on off
- Overdrive: set it to on to have good event synchronization
- Scheduler in audio interrupt: control synchronization. Set it to on
- AltiVec optimization: set it to on
- CPU limit: set the value to 95
- Cpu usage: displays the CPU load and peak
- DSP on/off: activate/desactivate the digital signal processing

All changes are stored automatically in the preferences of the application



### Patch presentation - SAMPLER Configuration

- Sampler instrument file: name of the file defining all keygroups
- Voice stealing: should be activated
- Polyphony: number of samples played simultaneously. Can be reduced to 32 but 40 is good minimal value.
- Sustain init value: to disable the sustain, deactivate the toggle

### SAMPLER - presets:

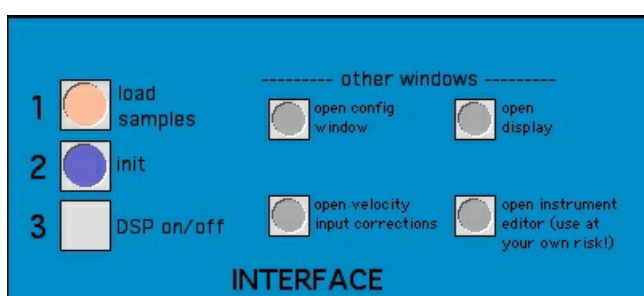
- Recall user preset: load user presets loading at each patch initialization
- Recall factory preset: load factory or default presets
- Store user preset: allow you to valid and store any changes
- revert user preset back to factory preset: replace user presets by factory ones



### Patch presentation - Details of Main Patch

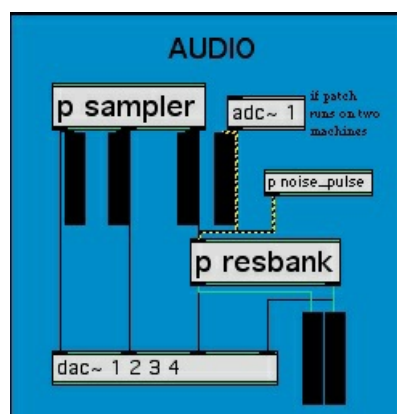
#### INTERFACE

- load samples is used to load audio files
- init is used to initialize the patch
- DSP on/off allows you to activate/desactive the signal processing
- the sub-part other windows give access to other setup and displays



#### AUDIO

The AUDIO part is composed of a sampler, filter bank (“resonators”) and outputs.  
Use the vu-meters to control the levels during the performance.



### Patch presentation - LEVELS Configuration

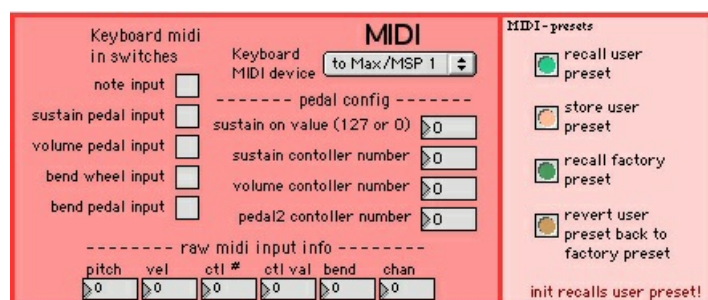
- Sampler output level: direct piano outputs levels
- Sampler to resbank level: level of the piano outputs linked to the resonators (in dB)
- Resbank output level: resonances outputs levels (in dB)

LEVELS - presets (cf. SAMPLER Configuration)



### Patch presentation - MIDI Configuration

- Note input: activate/desactivate MIDI note inputs
- Sustain pedal input: activate/desactivate sustain pedal input
- Volume pedal input: activate/desactivate volume pedal input
- Bend wheel input: activate/desactivate pitch wheel input
- Bend pedal input: activate/desactivate the pitch bend pedal input
- Keyboard OMS device: choose appropriate OMS device system (not available in Mac OSX version)
- Sustain on value: value sent when the pedal is pressed
- Sustain controller number: number of the MIDI control of the sustain pedal
- Volume controller number: number of the MIDI control of the volume pedal
- Pedal2 controller number: number of the MIDI control of the pitch bend pedal
- Raw midi input info: display MIDI messages sent by the keyboard



### Patch presentation - RESONATORS Configuration

- Tuning: resonators are tuned with the samples (in 16th-tone)
  - divisions of a semitone: 8 division of the half-tone
  - starting note: 60 for central C
- Sustain input level multiplier: 20, when sustain is activated the resonances are longer so you will need more volume
- No-sustain input level multiplier: 1, when sustain is disabled the resonances are shorter so you will need less volume
- Resonance bank sub-division pans: each bank of resonators is composed of 3 parts to create 3 panoramic positions
- Frequency multipliers: each bank is related to an harmonic range on the piano (Frequency multiplier = harmonic)
- Amplitude multipliers: amplitude of each bank
- Sustain decay rate multipliers: coefficient of decay of the resonators during the sustain
- No-sustain decay rate multipliers: coefficient of decay of the resonators without sustain
- Mutes: each bank can be stopped to get more CPU load. If you use a powerful macintosh you can activate all 4 banks (desactivate the toggle mutes)

Noise test:

- noise pulse width: timing in millisecond of the noise pulse
- noise volume: volume of the noise
- trigger noise pulse: click here to activate noise pulse in the resonators

RESONATORS - presets (cf. SAMPLER Configuration)

**RESONATORS**

tuning : divisions of a semitone  starting note

sustain input level multiplier

no sustain input level multiplier

resonance bank sub-division pans (0=left, 0.5=center, 1=right)

bank	pan A	pan B	pan C	frequency multipliers	amplitude multipliers	sustain decay rate multipliers	no-sustain decay rate multipliers	mutes
bank 1	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="checkbox"/>
bank 2	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="checkbox"/>
bank 3	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="checkbox"/>
bank 4	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="checkbox"/>

noise test : noise pulse width (ms)  noise volume 0-127  trigger noise pulse ☐

RESONATORS-presets

☐ recall user preset ☐ recall factory preset

☐ store user preset ☐ revert user preset back to factory preset

init recalls user preset!

## Patch presentation - Display Window

In the INTERFACE part of the main window, click on the “open display” button .

**MIDI keyboard Input Displays**

Sustain ☐ Volume pedal  Bend Pedal  Bend Wheel

press <esc> to close window

vel  bendzone

note input ☐ sustain pedal input ☐ volume pedal input ☐ bend wheel input ☐ bend pedal input ☐

**Interactive panel**

0 = monophonic keys; 1 = polyphonic keys ☐ sampler/res sustain ☐ autoplay: 0, autoplay off; 1, single notes; 2, cluster of 8 notes; 3, cluster of 16 notes

linear 0. to 1.  sampler pedal volume  sampler bend  autoplay - velocity

init  all notes off  reset Bend

**Audio**

DSP on/of ☐

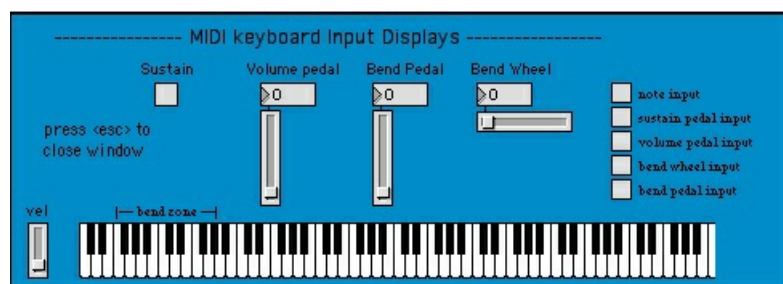
cpu usage  peak  reset

sampler voice allocation

8	0 0 0 0 0 0 0 0
16	0 0 0 0 0 0 0 0
24	0 0 0 0 0 0 0 0
32	0 0 0 0 0 0 0 0
40	0 0 0 0 0 0 0 0
48	
56	
64	

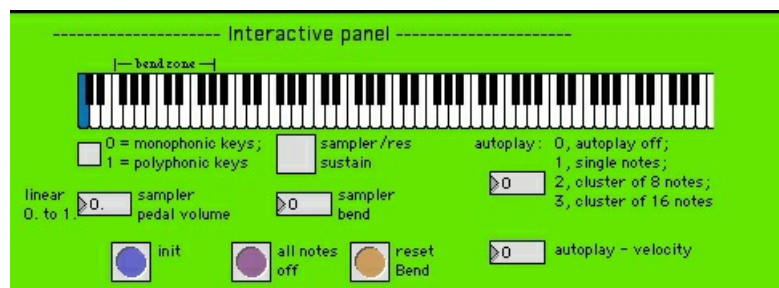
## Patch presentation - MIDI keyboard Input Displays

Look at the MIDI messages sent by the keyboard (sustain, volume, bend pedal, bend wheel, velocity, pitch)  
 Right toggles activate or deactivate each relative MIDI input (type)



### Patch presentation - Interactive Panel

- Keyboard: to play piano with the mouse
- Monophonic keys / polyphonic keys: to get polyphonic / monophonic effect
- Sampler/res sustain: activate/desactivate sustain for the sampler and the resonances
- Sample pedal volume: volume of the piano (between 0.0 and 1.0)
- Sampler bend: pitch bend of the sample (0-127, 64 = default value)
- Autoplay modes are
  - 0, deactivate autoplay
  - 1, individual notes
  - 2, clusters of 8 notes
  - 3, clusters of 16 notes
- Autoplay velocity: volume of the “auto-activated” notes
- INIT: initialize all parameters
- All notes off: cut volumes of all played note and resonances
- Reset Bend: set the default value (64)



### Patch presentation - Audio

- DSP on/off: activate/desactivate audio signal processing
- Cpu usage: display CPU load in percent
- Display the number of free voices and their allocation(1 = busy, 0 = free)



Audio

DSP  
on/of

opu usage

0

0

peak

reset

sampler  
voice  
allocation

8	00000000
16	00000000
24	00000000
32	00000000
40	00000000
48	
56	
64	

Patch presentation - Velocity Correction

In the INTERFACE part of the main window, click on the velocity input corrections button.  
The response curve of the velocity has been set to have the best response from the KX88 keys. This should allow you to play pianissimo, then increase to 127 without pressing the keys too hardly.

- Vel scale factor: multiplier factor of volume values where 1 = no change (default = 1.2).
- Velocity curve factor: curve definition. Positive for exponential, negative for logarithmic (default = 1.4).

VEL - presets (Cf.: SAMPLER Configuration).

note: KX88 keys take too much force to reach vel 127.  
This scaling allows velocity to reach 127 with less force.

vel scale factor

(recommended around 1.2)

0.

velocity curve factor

(recommended around 1.4)

0.

pos = exponential;  
neg = logarithmic;  
0 = linear

vel in

0

0

vel out

graphic  
representation  
of velocity  
curve

press <esc> to  
close window

VEL-presets

recall user  
preset

store user  
preset

recall factory  
preset

revert user  
preset back to  
factory preset

init recalls user preset!

Patch presentation - Sample Keygroup Editor

In the INTERFACE part of the main window, click on the “open instrument editor” button

15/17

### Simple Sample Instrument Editor

keygroup

save changes

revert to saved

instrument data file

<p>pitch lo pitch hi</p> <input type="text" value="0"/> <input type="text" value="0"/>	<p>amp scale (0 - 99)</p> <input type="text" value="0"/>	<p>env att ms</p> <input type="text" value="0"/>
<p>vel lo vel hi</p> <input type="text" value="0"/> <input type="text" value="0"/>	<p>amp veltk amt (-99 to 99)</p> <input type="text" value="0"/>	<p>env dec ms</p> <input type="text" value="0"/>
<p>sample name</p> <input type="text" value="p3forte-do"/>	<p>pan follo pch</p> <input type="text" value="0"/>	<p>env sus dB</p> <input type="text" value="0"/>
<p>root pitch</p> <input type="text" value="0"/>	<p>pan fol hi pch</p> <input type="text" value="0"/>	<p>env sus dec ms</p> <input type="text" value="0"/> (-1 = infinite)
<p>detune (+/- cents)</p> <input type="text" value="0"/>	<p>pan follo pos (-99 to 99)</p> <input type="text" value="0"/>	<p>env vel ms</p> <input type="text" value="0"/>
<p>tuning numerator</p> <input type="text" value="1"/>	<p>pan fol hi pos (-99 to 99)</p> <input type="text" value="0"/>	<p>env amt (0-99)</p> <input type="text" value="0"/>
<p>tuning denom</p> <input type="text" value="1"/>	<p>filter freq</p> <input type="text" value="0"/>	
<p>loop on/off</p> <input type="checkbox"/>	<p>filter veltk amt (-99 to 99)</p> <input type="text" value="0"/>	
<p>bend range</p> <input type="text" value="0"/>	<p>filter keytrack on/off</p> <input type="checkbox"/>	<p>press &lt;esc&gt; to close window</p>

## Details - About the pedals

Look at the 16th-tone Piano part of the instruction Setup

### Volume

To have optimum control of the dynamic on this piano, a volume pedal has been added. The performer must adapt his style to the sensitivity of the pedal to find the dynamic of this piece.

### Bend

In this version, the sampler is integrated in the patch. That allows you to activate the pitch bend only for certain keys of the keyboard. There is a bend zone in the left part of the keyboard (between F1 and G#0).

The Bend pedal works only in this area. This allows you to play as far as the bass C by pressing slowly the pedal, leave the pedal pressed, then continue to play in the right side of the keyboard.

At the end of the resonance time of the note, release the pedal. In this way, medium et treble notes are not affected by the pitch. This requires all the attention of the performer!

### Pitch Bend

This works with the same principle. But the initial position and value is set to the middle.

### Sustain

The sustain is used continuously. The patch implement this functionality (cf. toggle sampler/res sustain locate in display>Interactive panel ).

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## Program note

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*Rebonds* est fondée sur le principe de la superposition de trois modes écrits pour trois pianos accordés différemment : l'un sur le principe du tempérament, l'autre en relation de quarts de tons et le troisième en seizièmes de tons. L'intérêt de ces superpositions ne se résume pas à l'utilisation paradoxale des battements. Ce qui me semblait essentiel était la relation enharmonique des différents modes qui provoque lors de la rencontre micro-intervallique des unissons et des battements complexes.

*Rebonds* utilise deux principes d'écriture. Le premier élucide la signification du titre : il s'agit d'une polyphonie par rebondissements à l'unisson de lignes écrites en canon selon les principes que j'ai déjà développées dans *Préfixes* et dans mes *Trois études pour piano*. Le second principe est celui de l'ornementation. Le piano en seizièmes de tons ornemente des unissons de la flûte, du violon, du violoncelle et de la clarinette.

La forme de l'œuvre est conçue en boucle fermée ou spirale. Le système tournoyant qui se referme donc sur lui-même procède de la superposition des modes micro-intervalliques. La forme n'est donc pas conçue comme une évolution directionnelle mais comme un système clos.

Michaël Levinas.

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