HIROSHIMA

Work for a whole body interactive performance

The work was world-premièred at Inspace, Edinburgh, U.K. on 27th April 2010.

The work was created as a collaboration of two artists:

Shiori Usui:

Composition and Performance

Vangelis Lympouridis:

Whole Body Interaction and Sound Design

Special Thanks to:
Sean Williams: sound recording and audio engineering of the première.
Michael Cullen: assistance and contribution of sound source (high frequency signals and low bass)
D.K Arvind, Alex Young, Paul McEwan and Martin Ling: assistance on the Orient motion capture system
Prof. Nigel Osborne and Prof. Peter Nelson: supervision – Shiori Usui
Dr Martin Parker: supervision – Vangelis Lympouridis
Mark Daniels: Inspace (Edinburgh, U.K.)

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Inspace, Edinburgh
Arts and Humanities Research Council (AHRC)
Overseas Research Student Award Scheme (ORSAS)

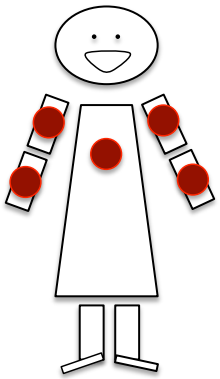
Technical Requirements

Real-Time Motion Capture: Orient -3 wireless sensor base system
visualisation software (with motion viewer application) for the Orient motion capture system
Max/MSP patch
8 speakers
1 subwoofer
1 small microphone for live voice input (e.g. DPA mic./wireless mic.)
1 chair for a performer
1 medium size desk for a performer
1 large desk for a operating the systems
two laptops for operating the Orient motion capture system and Max MSP patch
external sound card
8 channel mixer
stage lighting as a single/multiple spot(s) is ideal

For more information on the Orient motion capture system, please visit;
http://www.specknet.org/
http://homepages.inf.ed.ac.uk/ayoung9/orient.html#Overview

Speck Sensors on Body

1 left forearm
1 right forearm
1 left upper arm
1 right upper arm
1 chest



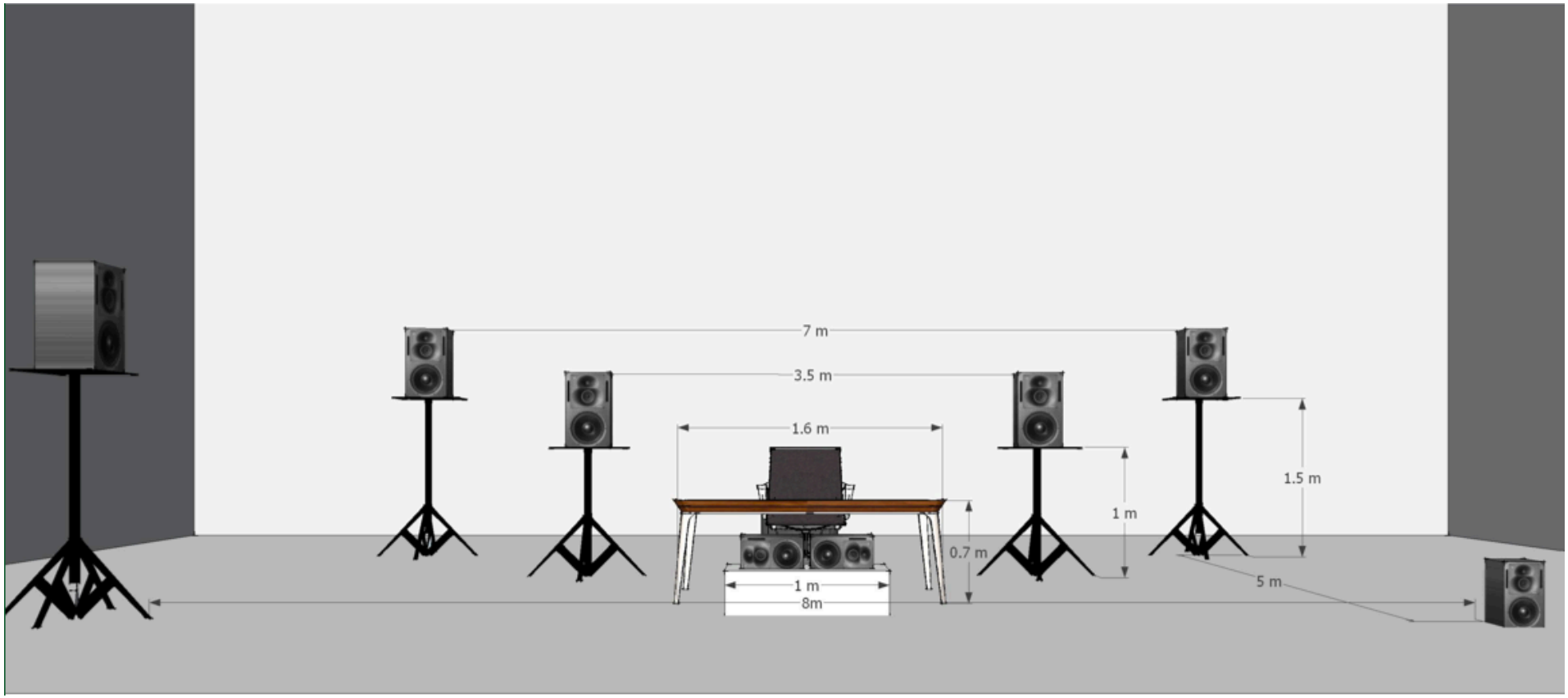
Position of Speakers and Performer

Hiroshima: Whole body Interactive performance 3D sketch visualization

3D Image by Vangelis Lympouridis

Hiroshima: Whole body Interactive performance 3D sketch visualization

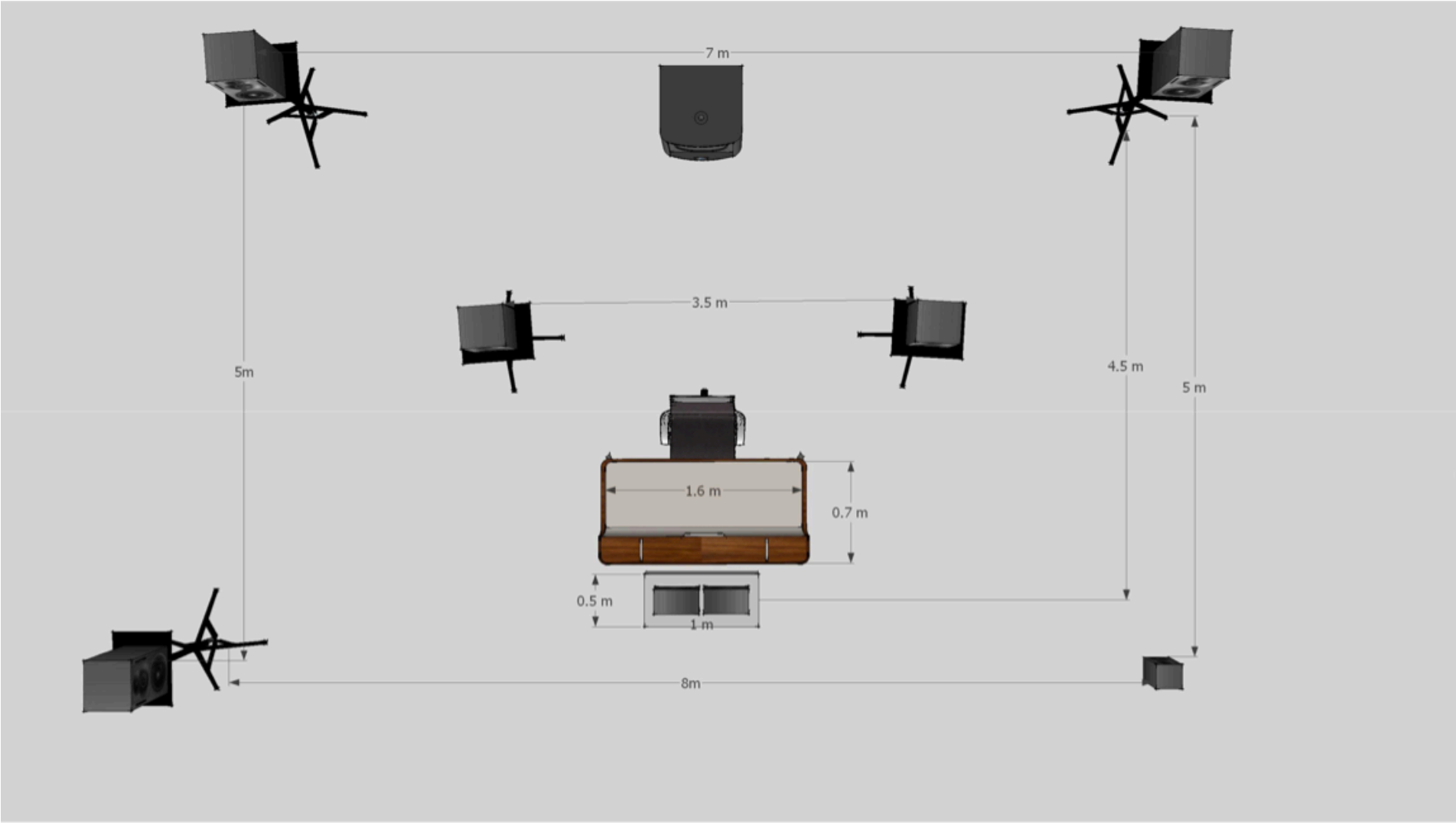
Front View



3D Image by Vangelis Lympouridis

Hiroshima: Whole body Interactive performance 3D sketch visualization

Top View



3D Image by Vangelis Lympouridis

Notes for Musical Notation

NOTE-HEAD

 approximate pitch

 low pitch

ACCIDENTALS

 a little flatter (from already flattened pitch)

 a little flatter (from the pitch without any normal sharp or flat accidental)

INTRODUCTION

TIMELINE	1 min.	15 sec.	1 min.

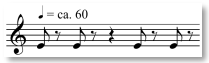
CLOCK A: speaker 7

TYPE OF SOUND: speakers

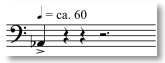
PARTS OF BODY USED
body movement
➢ resultant sound

SPINE

sitting still
➢ normal playback of audio



bending backwards
➢ lower pitch ➢ slower ticking sound

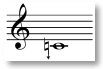


e.g.
The clock sound when the body is bent extremely backwards.

bending forwards
➢ higher pitch ➢ faster ticking sound

e.g.
The clock sound when the body is bent extremely forwards.

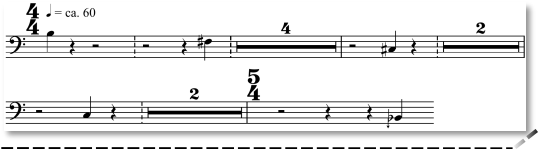
AUTOMATED PRE-SET
➢ repetition of the same pitch.



➢ CUE to the performer indicating that the piece moved to the next stage.

AUTOMATED FADE-OUT

➢ transposition to lower pitch
➢ less frequent occurrence of the sound.

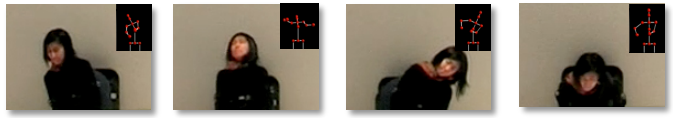


Notes for performance practice

➢ Be aware of the axis (i.e. spine) and feel the weight of your body.
➢ In quest for balance of your body.
➢ Explore the subtle changes of the speed and pitches of the clock sound.

Notes for performance

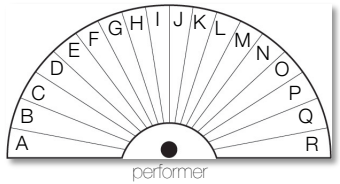
➢ Move the body slowly most of the time. A few sudden changes of speed and pitch of the sound in between.
➢ Do not move your feet.
➢ Eyes closed.
➢ Imagine that you are travelling through the time.



COOKING A: speakers 3 & 4

LEFT AND RIGHT FOREARMS
➢ Intensity of the hitting movement corresponds with the triggering of different samples

AREA-PHONE
➢ Samples distributed 180 degree of space in front of the performer.
➢ Area divided into 18 spaces with 54 samples distributed.



➢ Practice by using different parts of hands.
e.g. fingers, only arms, palm facing up/down.

CONTROL (approx. 30 sec.)
➢ Imagine that you are "conducting" an orchestra or playing an instruments with different sound colours and pitches.

EXAMPLE: SEQUENCE 1

WIND: speaker 3 (L.H.), speaker 4 (R.H.)

TYPE OF SOUND: speakers

PARTS OF BODY USED
body movement
➢ resultant sound

LEFT AND RIGHT FOREARMS

movement of arm
➢ playback of audio ON

no movement of arm
➢ playback of audio OFF

velocity of movement
➢correspond to the intensity of sound
e.g. when the velocity of movement is strong, the volume of the sound increases.

Notes for performance practice

➢ Note that the right and left forearms trigger different audio samples respectively.
➢ Practice with only left or right forearm respectively and with both forearms together.

Notes for performance

➢ Move the forearms after playing with the clock sound.
➢ Eyes closed.
➢ Create rhythmic interplay with the clock sound.

YOKO'S VOICE: speaker 1 (L.S.), speaker 2 (R.S.)

TYPE OF SOUND: speakers

PARTS OF BODY USED
body movement
➢ resultant sound

LEFT AND RIGHT SHOULDERS

movement of shoulder
➢ playback of audio ON

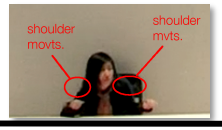
no movement of shoulder
➢ playback of audio OFF

Notes for performance practice

➢ Note that the right and left shoulders share the same audio samples.
➢ Note that the audio samples are arranged from phonemes to small phrases.

Notes for performance

➢ Eyes open when the sound of voice is heard (from unconsciousness to consciousness) . As if hearing or reacting to someone's voice.



ALERT I

30 sec. | 21 sec. | 22 sec. | 20 sec. | 1min. 3 sec.

LIST FOR AREA-PHONE A SAMPLES

➢ The different samples are triggered according to the intensity of the hitting movement (see Appendix 1).

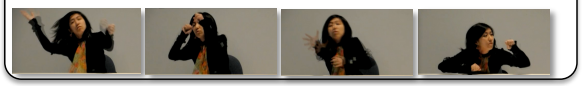
A: Sound of stacking saucers No.1, stacking saucers No.2
B: Sound of saucers put away, saucers sliding
C: Sound of grabbing bowl from cupboard, grabbing glass from cupboard
D: Sound of plates removed No.1, plates removed No.2, stacking plates
E: Sound of plates straightening up, plates put away No.4, glasses being stacked
F: Sound of plastic roll No.1, plastic roll No.2, plastic plate No.3, plastic plate No.4
G: Sound of plastic bowl No.1, plastic plate No.1, plastic bowl No.2, plastic plate No.2
H: Sound of chopping 4, 5, 6
I : Sound of chopping 1, 2, 3
J: Sound of wood No.7, wood No.8, wood No.9, wood No.10
K: Sound of wood No.4, wood No.5, wood No.6
L: Sound of wood No.1, wood No.2, wood No.3
M: Sound of glass put down, slide, drawer closed
N: Sound of desk drawer, desk drawer closed
O: Sound of pots pulled out No 3, pots put away No.2, pots put away No.3, pots bang
P: Sound of pots pulled out No.1, pots put away No.1, pots pulled out No.2
Q: Sound of pot lid 1, 2, 3, 4
R: Sound of hitting metallic object 1, 2, 3

BREAK (approx. 30 sec.)

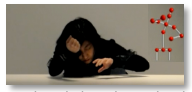
➢ Use the movements associated with cooking.
e.g. chopping, pulling drawer or containers, placing dishes, opening the door of dish cabinet, mixing, adding etc.

➢ Hint of domestic human activities.

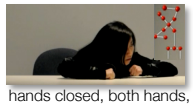
EXAMPLE: SEQUENCE 2



EXAMPLE OF POSITIONS



one hand closed, another hand open with palm down, leaning forward



hands closed, both hands, leaning forward

palm down, both hands,

hands closed, both hands

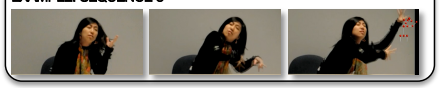
palms down, both hands, hands at different height, leaning forward

MIXTURE

➢ Break the relationships between the image and sound that you created previously (i.e. the image and sound of cooking) by applying different gestures to similar types of sounds.
e.g.1: Apply the gesture of "mixing some cooking ingredients in a metal bowl" to more "wooden" timbre such as chopping sound.
e.g. 2 Apply "cutting" gesture used for chopping sound to more "metallic" timbre.

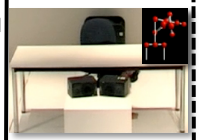
➢ Also mix with the "conducting orchestra" or "playing instrument" approach.

EXAMPLE: SEQUENCE 3



NO SOUND TRIGGER -ED BY BODY MOVT.

➢Sensors do not react to the body movement.
➢Hide under the table.



CUE for hiding under the table.

CUE for start moving the shoulders under the table.

STOMACH speakers 1 (L.S.) & speaker 2 (R.S.)

LEFT AND RIGHT SHOULDERS

movement of shoulder
➢ playback of audio ON

no movement of shoulder
➢ playback of audio OFF

➢ Start moving the shoulders even when you are still hiding under the table.
➢ Come back to the original position while playing with the stomach sound.
➢ Controlled with minimal gestures.

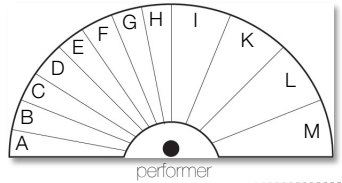
COOKING B speakers 3 & 4

LEFT AND RIGHT FOREARMS

➢ Intensity of the hitting movement corresponds with the triggering of different samples.

AREA-PHONE B

➢ Space divided into 12 areas and 18 samples distributed in total.
right forearm - 4 areas with 10 samples
left forearm - 8 areas with 8 samples

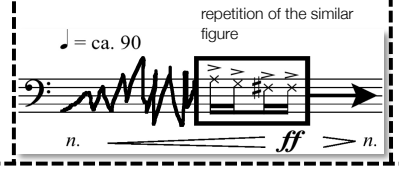


NORMAL

➢ Gestures associated with fire and water e.g. gesture of lighting a match, (idea expanding to the gesture of rubbing two arms together, gesture of extinguishing the fire etc.

ENGINE speakers 5 & 6

panning from speaker 5 to speaker 6
PRE-DESIGNED



REAL VOICE speakers 1& 2

REAL-TIME VOICE INPUT - unprocessed

➢ vowel based sound
➢ sound of exhaling air

RADIO speaker 8

PRE-COMPOSED

➢ white-noise, beating effect, radio tuning sound

HIGH FREQUENCY SIGNALS speakers 5 & 6

PRE-COMPOSED

NORMAL I

20 sec. | 3min. 10 sec.

AUTOMATED FADE-OUT

(COOKING B) – "MASTER" – speakers 3 & 4

MASTER – SLAVE ALGORHITHM

- The movement used for Cooking B is recorded, and used directly for triggering the rhythmic content of the 2 voices –"slave" – (see below).
- After playing with Cooking B, stay still for a few seconds to allow that the sound of voice is triggered.
- Imagine as if you are inside the stomach. Move like a small creature living in the stomach

2 VOICES – "SLAVE" – speakers 1 & 2

MASTER – SLAVE ALGORHITHM

- The movements of forearms used for Cooking B are recorded, and used directly for the rhythmic content of the 2 voices –"slave" – .
- The rhythmic content of "Male voice" is shaped according to the movement of right hand, and the "Female voice" is by left elbow.

LIST FOR AREA-PHONE_B_SAMPLES

- The different samples are triggered according to the intensity of the hitting movement (see Appendix 2).

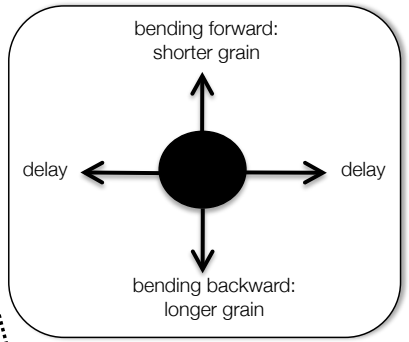
A: Sound of match – low pitch
B: Sound of match – middle pitch
C: Sound of match – high pitch
D: Sound of lighting match – low pitch
E: Sound of lighting match – "lower middle" pitch
F: Sound of lighting match – middle pitch
G: Sound of lighting match – "higher middle" pitch
H: Sound of lighting match – high pitch
I : Sound of pouring coffee, pouring liquid into plastic cup, pouring liquid Styrofoam cup No.1, pouring liquid into Styrofoam cup No.2
J: Sound of sink filled with water, kitchen sink
K: Sound of kettle being poured into cup, pouring coffee
L: Sound of meat sizzle, water boiling

REAL VOICE: speakers 1& 2

REAL-TIME VOICE INPUT - processed

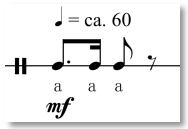
SPINE

- The movement of bending forward and backward controls the granulation.
- The movement of bending right and left controls the delay effect.

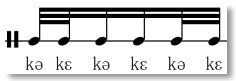


- phoneme based sound
- 'conversation' using phonemes with the "2 Voices" (i.e. "slave" voices) coming out from the speakers 1 & 2
- imitation, repetition, variation, retrograde of the sound of the "2 Voices"
- fragments of laughter
- tension and release (e.g. short consonants and longer words/sporadic fragments of laughter)

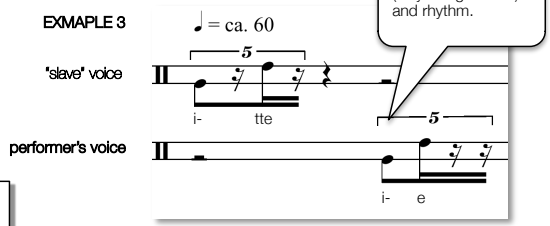
EXAMPLE 1: VOWEL



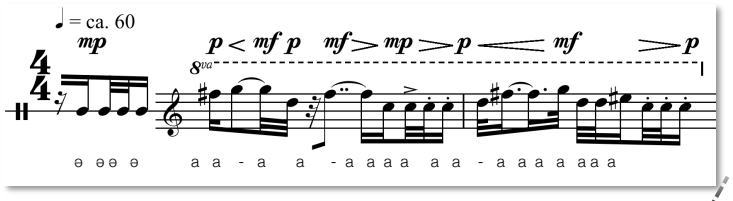
EXAMPLE 2: CONSONANT & VOWEL



EXMAPLE 3



EXAMPLE 4

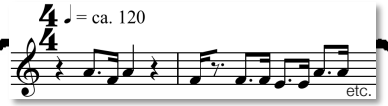


CUE for performer

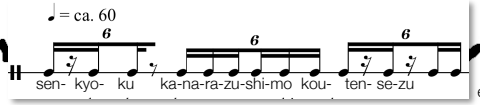
(RADIO continued)

hints of man's voice in Japanese (Hirohito)

fragments of Japanese songs



fragments of man's voice in Japanese (Hirohito)



- granularated sounds of songs and voice etc.

LOW BASS: subwoofer

PRE-COMPOSED

- volume: unnoticeable at the beginning. When there is less movement of body, the volume of the low bass increases.

ALERT II

1min. 14sec. | 28 sec.

BREAKING DISHES: speakers 3 & 4

RIGHT FOREARM

movement of forearm
- ➢ playback of audio ON
- ➢ 6 different types of sound files are played back according to the algorithm created.

no movement of forearm
- ➢ playback of audio OFF

- ➢ Hints for the forearm movements.
  - movements of throwing and grabbing.
  - very fast and slow movement.
  - with only one forearm or both left and right forearms.
  - angular shapes or angles

EXAMPLE: SEQUENCE 4 (RIGHT FOREARM CIRCLED WITH RED)

ANGRY VOICE: speakers 1 & 2

LEFT AND RIGHT SHOULDERS

movement of shoulder(s)
- ➢ playback of audio ON
- ➢ Left shoulder movements triggering 2 different sound files in turn.
- ➢ Right shoulder movements triggering 1 audio file.

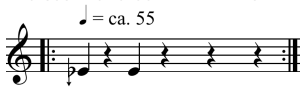
- ➢ The audio files including the small segment of words and phonemes are organized according to the intensity level of each sound file.
- ➢ They intensity of shoulder movements affects the selection of the sound being played back.

No movement of shoulder(s)
- ➢ playback of audio OFF

CLOCK B: speaker 7

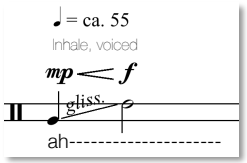
AUTOMATED

EXAMPLE 6: SOUND OF CLOCK B REPEATED UNTIL THE END



- ➢ distorted, harsh sound.
- ➢ voice inhalation (to the extent of not damaging vocal code!).
- ➢ phonemes
- ➢ extreme pitches
- ➢ short rhythmic values
- ➢ loud dynamics (e.g. *f, ff, fff*)

EXAMPLE 5: VOICE INHALATION

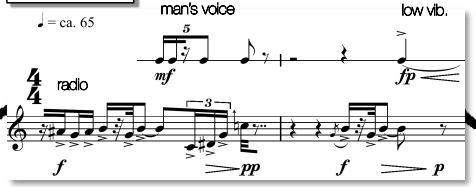


➡ less and less voice

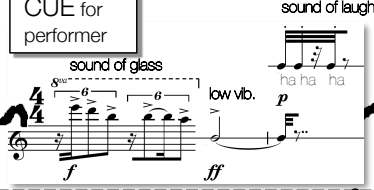
➡ fade out

HIGH FREQUENCY SIGNALS: speakers 5 & 6 > PRE-COMPOSED

CUE for performer



CUE for performer



NORMAL II

1 min. 52 sec. | 45 sec.

BREAKING DISHES – Reversed Sound: speakers 3 & 4

RIGHT FOREARM

movement of forearm
- ➢ playback of audio ON
- ➢ just 1 sound file triggered

no movement of forearm
- ➢ playback of audio OFF

- ➢ more extreme movements (e.g. extremely fast/slow movement)

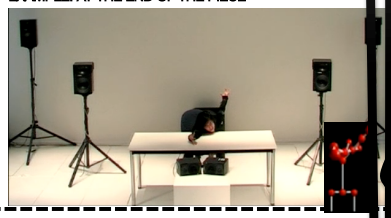
EXAMPLE OF MOVEMENTS

CLOCK A: speaker 7

- ➢ Live-processing of samples.
- ➢ Same as before the Clock A before.

- ➢ Try to gain the balance with movements again.

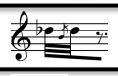
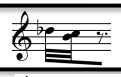
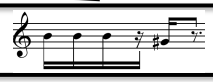
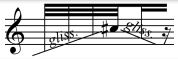
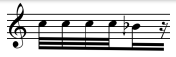
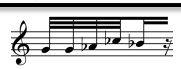
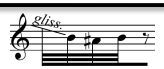
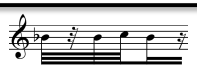
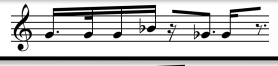
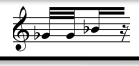
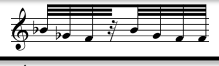
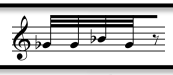
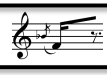
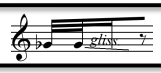
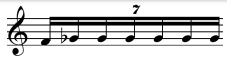
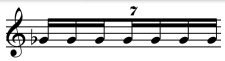
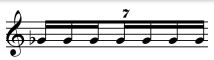
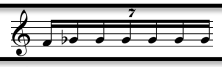
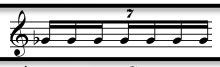
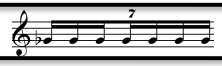
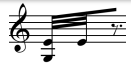
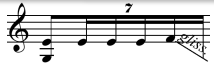
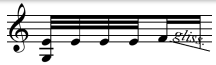
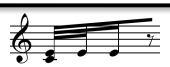
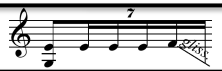
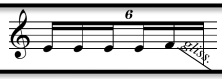
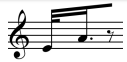
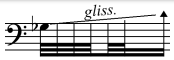
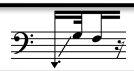
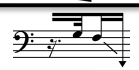
EXAMPLE: AT THE END OF THE PIECE



APPENDIX 1

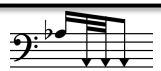
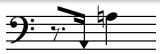
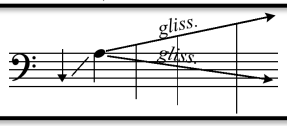
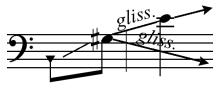
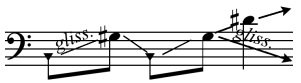
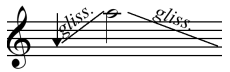
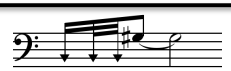
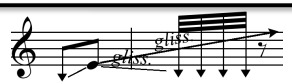
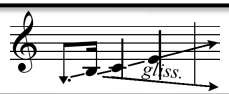
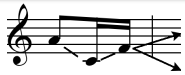
Area-phone A: approximate references of pitches for each sample

NOTE: Defining the Velocity of Movement
The calibration procedure before the performance defines the threshold of the velocity with the lowest intensity (i.e. where there is no sound).
The range between the lowest threshold value and the maximum pre-recorded intensity value was then equally divided by the numbers of samples that are used.

	GENERAL TIMBRE	**LOW** VELOCITY OF MOVEMENT ← → **HIGH** VELOCITY OF MOVEMENT			
A	ceramic				
B	ceramic				
C	ceramic				
D	ceramic				
E	ceramic				
F	plastic				
G	plastic				
H	wood				
I	wood				
J	wood				
K	wood				
L	wood				
M	wood				
N	wood				
O	metallic				
P	metallic				
Q	metallic				
R	metallic				

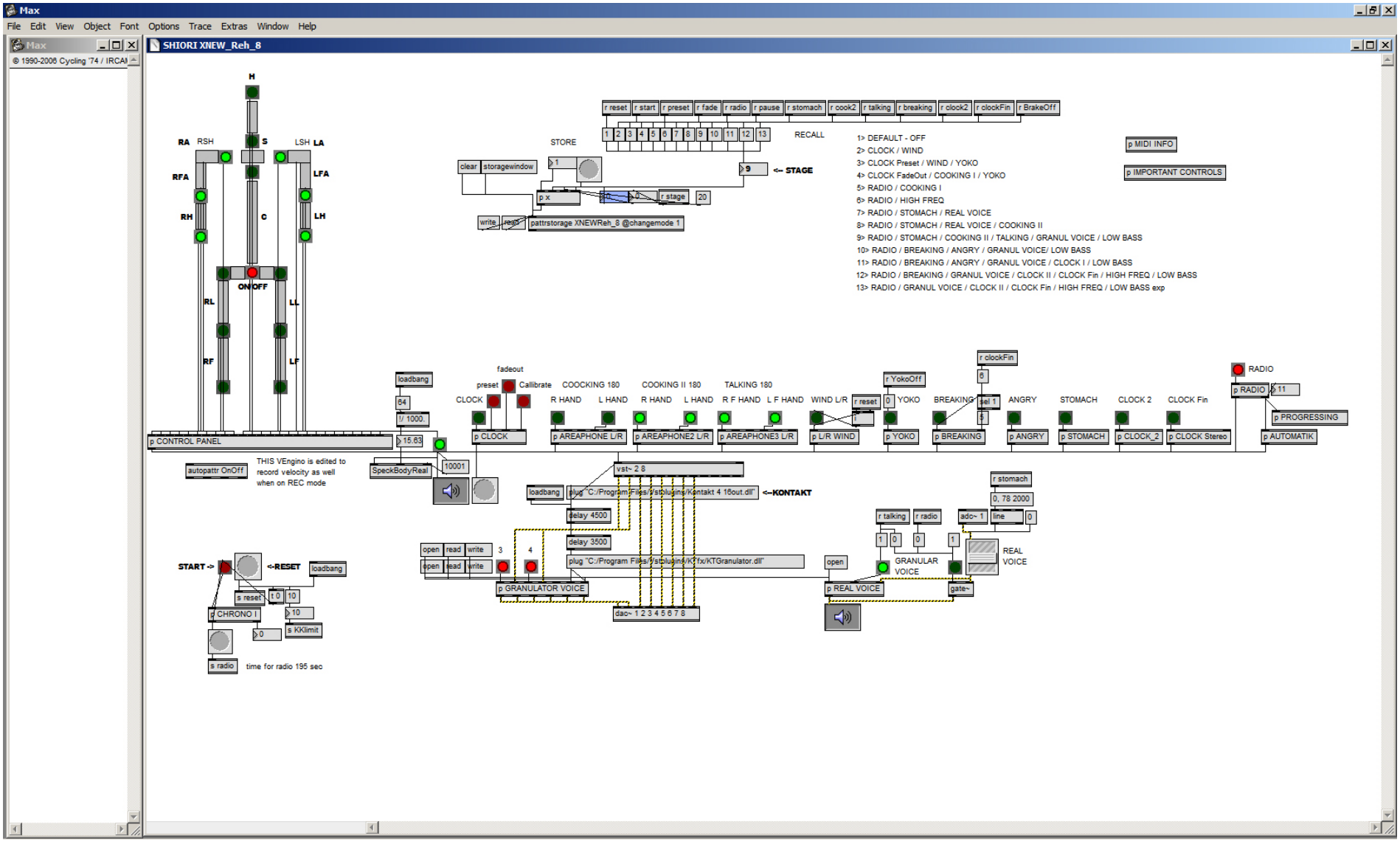
APPENDIX 2

Area-phone B: approximate references of pitches for each sample

	GENERAL TIMBRE	**LOW** VELOCITY OF MOVEMENT ← → **HIGH** VELOCITY OF MOVEMENT			
A	fire				
B	fire	variable according to acoustic and the patch			
C	fire	variable according to acoustic and the patch			
D	fire				
E	fire	variable according to acoustic and the patch			
F	fire	variable according to acoustic and the patch			
G	fire	variable according to acoustic and the patch			
H	fire	variable according to acoustic and the patch			
I	water				
J	water				
K	water				
L	water evaporation/ water boiling	 white noise like sound	 white noise like sound		

APPENDIX 3

Max/MSP patch:



programmed by Vangelis Lympouridis