Sound, sense, and music mediation: A historical/philosophical perspective

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Introduction

- Sense to sound, sound to sense

  sense → associated with musical signification practice

  sound → associated with physical energy or matter

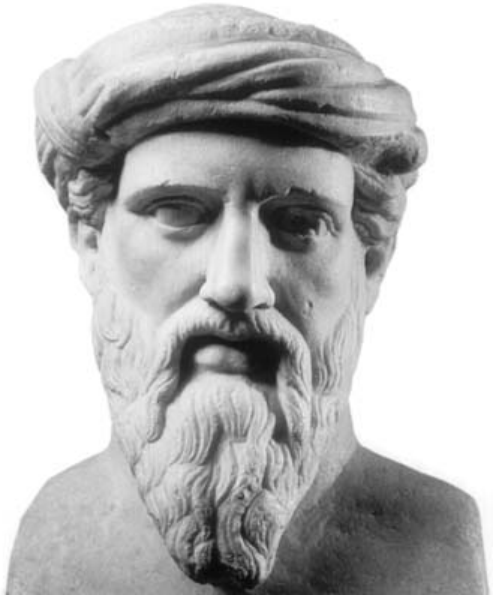
  music mediation → intermediary processes that account for the transition of musical sound into sense, or sense into sound
    - Mind?, Brain?, Body?
    - Technology (as extension)

- This overview:
    - FIRST PART: Historical/Philosophical overview
    - SECOND PART: Own research + perspective

Stating the problem

- Music can have a powerful effect on human beings. A better understanding of this effect is necessary for two reasons:
  - the development of **technologies for music mediation**
  - the enhancement of possible **beneficial effects**
- Technologies for **music mediation** aim at bridging the gap between sound and sense.
  - Humans think and act in terms of goals, values, interpretation
  - The physical approach considers music from the point of view of physical energy and signal processing.

Ancient Greek philosophy:



- Phytagoras:

  Focus on acoustics, the nature of tone relationships

- Aristoxenos:

  Music theory and musical practice

Ancient Greek philosophy:

- Aristotle: music is imitation of "men in action" – music moves our soul in a similar way – basis for understanding emotions
- Plato: music exerts power on people

Greeks → Descartes

- Réné Descartes (Musicae Compendium, 1618: good summary of state-of-the-art of ancient greek philosophy + germs of new ideas (mainly on resonance)

Basic explorations of:
- acoustics
- theory of musical practice
- theory of imitation

Medieval up to Modern times:

- Acoustics and music
  (Mersenne, 1636; Huygens, 1673; d'Alembert, 1743; Euler, 1748 – "Gradus suavitatis") - numerical methods

- Recipies of musical practice
  (Zarlino, 1558 ;Rameau,1722; Mattheson 1739 – Der Volkommene Kapelmeister - Affekenlehre)

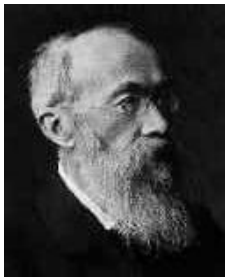
Scientific foundations of:
- Musical Acoustics and
- Music Theory

19th - beginning 20th Century:

- Psychophysics (psychoacoustics) (*On the sensations of tone* - v.Helmholtz, 1863)

- Acoustics (*The theory of sound* - Rayleigh, 1877)

- Experimental Psychology (Wundt, 1893)



Theory + experiment
➔ human brain connects sound and sense

Gestalt theory: 1920/30ies

- Stumpf (1883/90), Brentano (1924), Wertheimer, Köhler

- Focus on the perception of structure:
  - Gestalt laws: proximity, common fate…
  - Good forms: prägnanz
- Many scientists moved to USA → cognitive science

The cognitive approach

- Rationalism/empirism (18th Century)…
- Systematic musicology, Ethnomusicology (Stumpf, 1890; Kurth, 1917; v. Hornbostel, Sachs, 1914)
- Gestalt theory (Wertheimer, 1924; Köhler, 1929)
- Cognitive science (1960/70ies)…

➔ human brain (mental processing) connects sound and sense

Information theory

- Moles (1952, 1958), Winckel (1960)
- Entropy, channel capacity (Wiener, Shannon)

- Music conceived in terms of structural parameters
- Link with Berlyne's (1971) work on aesthetics: showing the relationship between arousal (→ appreciation) and structural features (→ novelty) = extending the Gestalt approach to aesthetics

Phenomenology and media technology

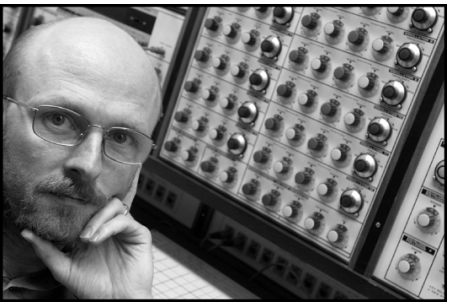
- P. Schaeffer (1966):
  - Role of subject – focus on structural properties (Gestalt-based)
  - Relationship between sound and sense is mediated by technology

•theory
•experimentation
•technology

Computational modelling of music cognition

- Information processing psychology (1960ies, Shannon, Wiener)
- Formal linguistics (Chomsky)
- Semiotics (Posner, Faltin Reinecke)

- Cognitive science – based on Gestalt theory
  → focus on structural aspects of music
  → mental processing connects sound and sense



  - Symbol-based (Laske, 1975, Baroni, 1984, Balaban, 1992)
  - Subsymbol-based (Todd and Loy, 1991, Leman, 1995)

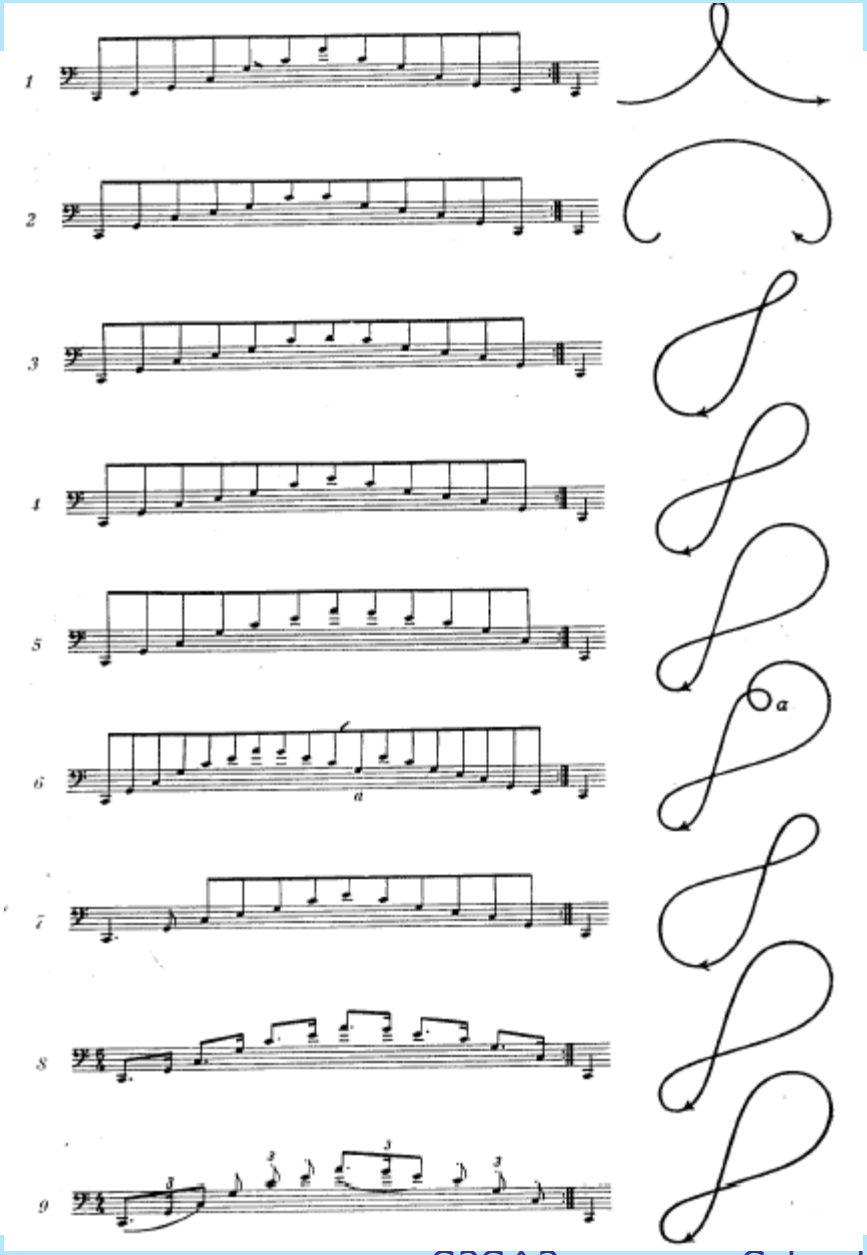
Beyond cognition

- Problems with the cognitive approach:
  - Neglection of subjective component - Postmodern thinking: « new musicology » (Lidov, Cumming, Hatten)
  - No solution to the sound/sense problem.
    - Gestalt theory focuses on structure.
    - Mental activity cannot account for intentionality
  - Maturana and Varela:
    - Cognition is the result of action
    - Body (not mind) connects sound to sense
    - Body (not mind) can be extended with technology

    → body and technology mediate between sound and sense

Motion research

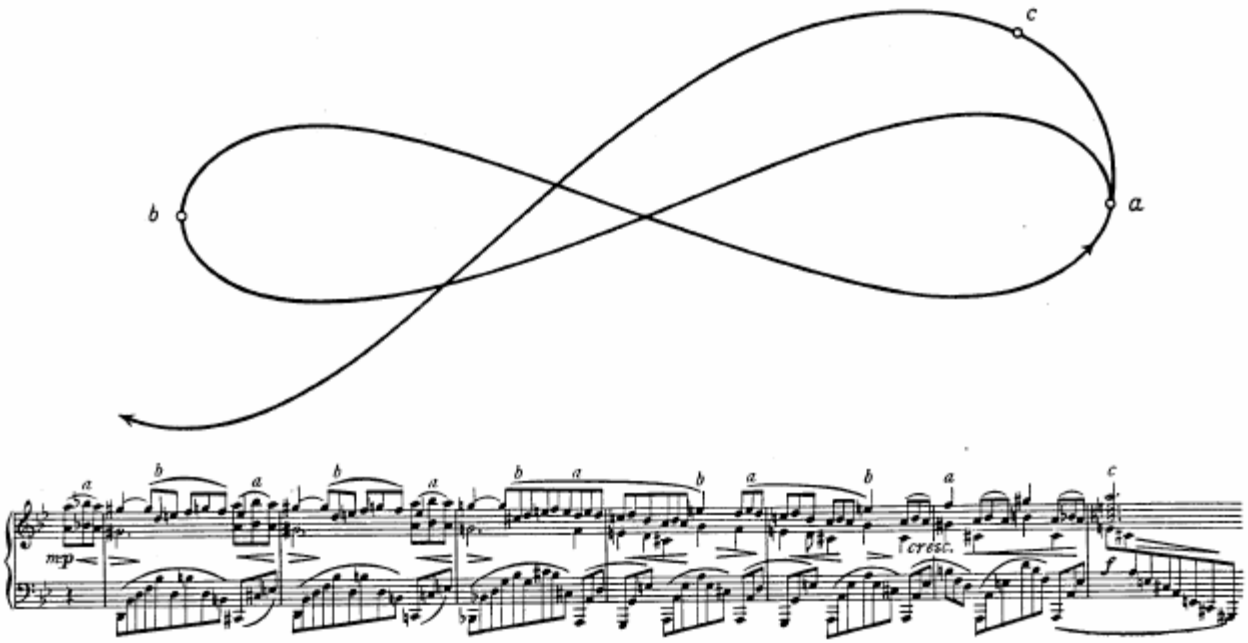
- Rediscovery of early motion research in the 1990ies:
  - Aristotle: music as imitation of « men in action »
  - Lipps (1903): aesthetic experience is imitation
  - Truslit (1938)→ Repp (1993)
  - Becking (1928)→ Nettheim (1996)
  - Mauss (1934)
  - Laban (1940ies)



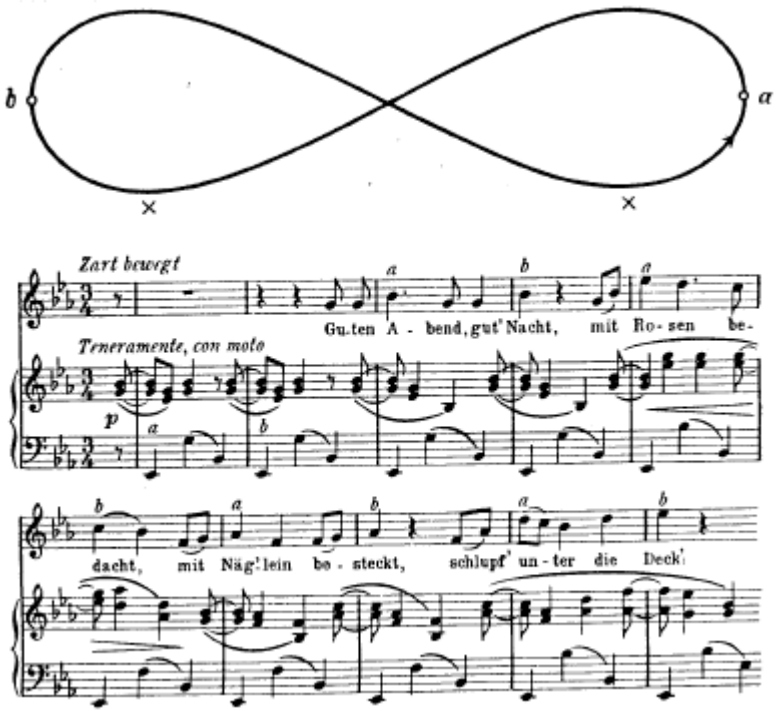
Truslit

1
Musikalische Form der Urbewegung
rit.
2
Urbewegung
3
Festgestellte Bewe
(ReproduzierteUrbeweg

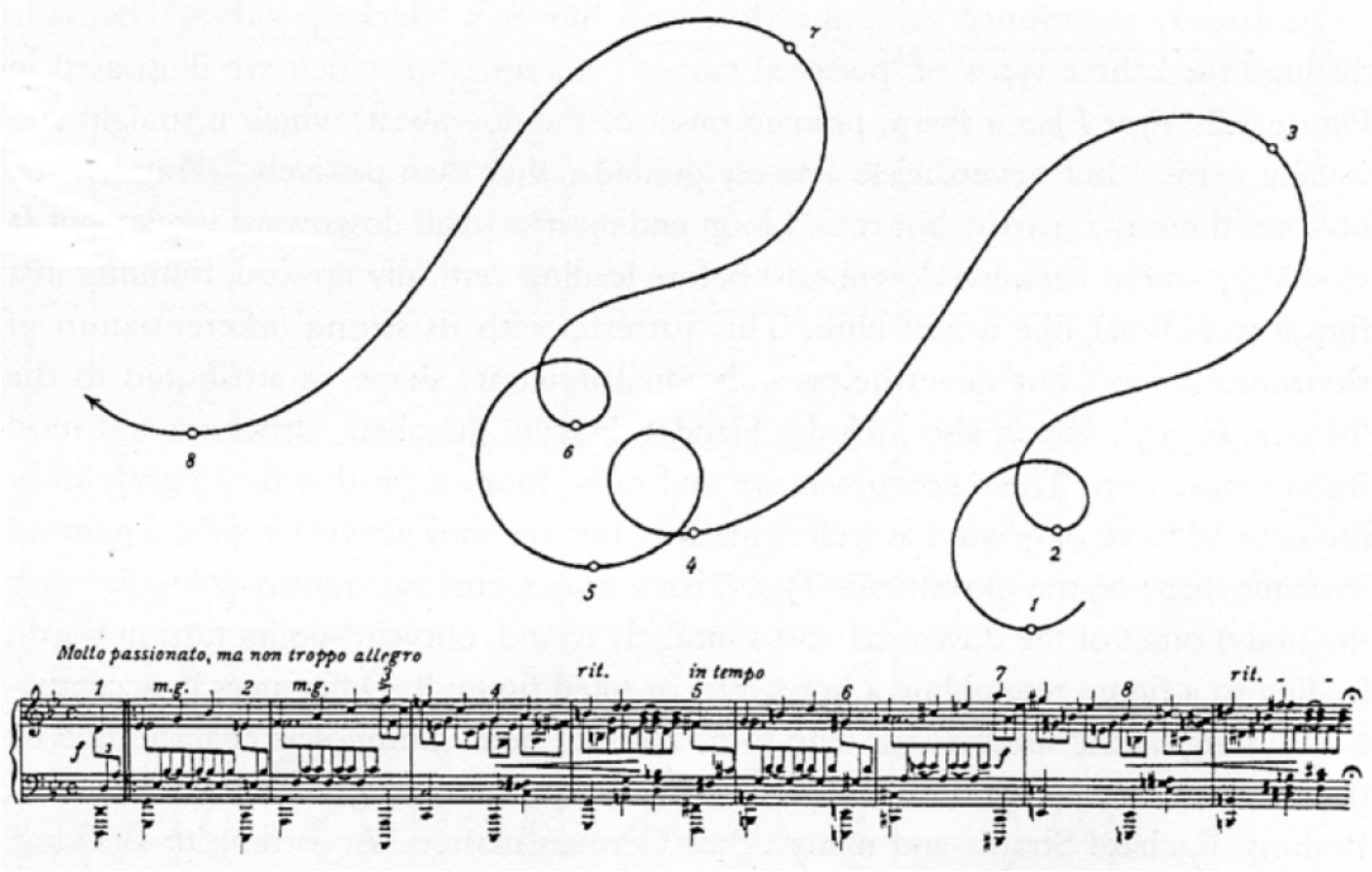
Truslit



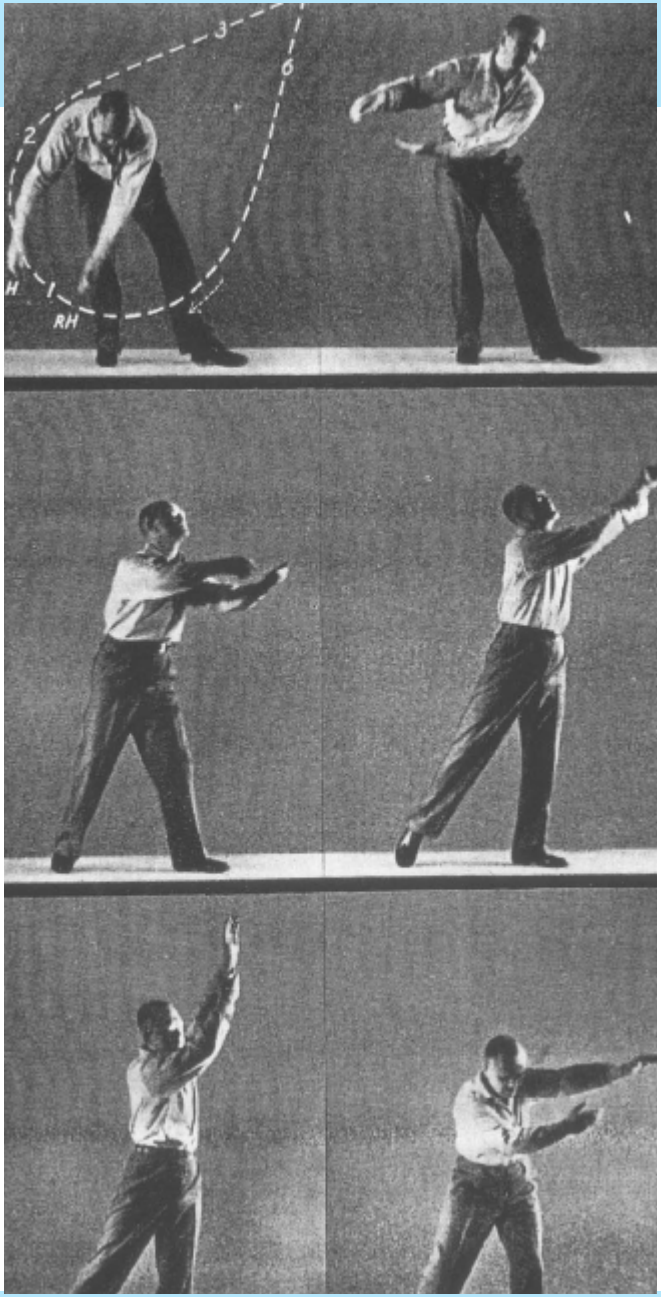
Truslit


b
a
Zart bewegt
Gu-ten A - bend, gut' Nacht, mit Ro-sen be-
Teneramente, con moto
p
dacht, mit Näg'lein be - steckt, schlupf' un - ter die Deck'

Truslit



Truslit, A. (1938). Gestaltung und Bewegung in der Musik. Berlin-Lichterfelde: Chr. Friedrech Vieweg.


3
2
6
H
RH

Historische Tabelle der Schlagfiguren.

(Die Kurven können nur andeutungsweise, die Anweisungen nur unvollständig gegeben werden.)

Typus	Der vorklassische Rhythmus in Deutschland					Der klassische Rhythmus in Deutschland						
	Barock (kursorisch)		Aufklärung			Klassik			Romantik			Wagner
	Generation von 1580	Generation von 1680	Rokoko	Rationalismus	Sturm und Drang	1. Klassiker	2. Klassiker	3. Klassiker	1. Generation	2. Generation	3. Generation	
I		Arm! Die Abstriche barock aushöhlend **Händel**				Herzhaft abwärts **Haydn**	Selbstverständlich abwärts. Sorgfältig getönt **Mozart**			Führen und Schwingen **Schubert**		
II	Schulter! starr **Schütz**	Arm! Gebunden schwingend **Telemann**	Hand! Frei schaukelnd **Hasse**	Ohne Schnörkel. Schlicht **Ph. E. Bach**				Tief abwärts zwingen **Beethoven**	Herziehen und Wegschieben **Hoffmann**	Links und rechts ausschwingen **Weber**	Herziehen und Wegschieben **Schumann**	
III	Schulter! starr **M. Franck**	Arm! Die Abstriche barock aushöhlend **J. Seb. Bach**		Nicht aushöhlend. Spröde **Gluck**	Explosionen **Stamitz**						Überfein **Mendelssohn**	Flackriger Druck **Wagner**

Becking

Emotion research

From disembodied (Gestalt) cognition to embodied cognition

- Hevner (1936), Watson (1942), Reinecke (1964), Imberty (1976), Wedin (1972), …
- Berlyne (1971) – relationship between subjective experience and objective descriptions of music
- Clynes (1977) – relationship between motino and emotion (sentics)

8
vigorous
robust
emphatic
martial
ponderous
majestic
exalting

7
exhilarated
soaring
triumphant
dramatic
passionate
sensational
agitated
exciting
impetuous
restless

6
merry
joyous
gay
happy
cheerful
bright

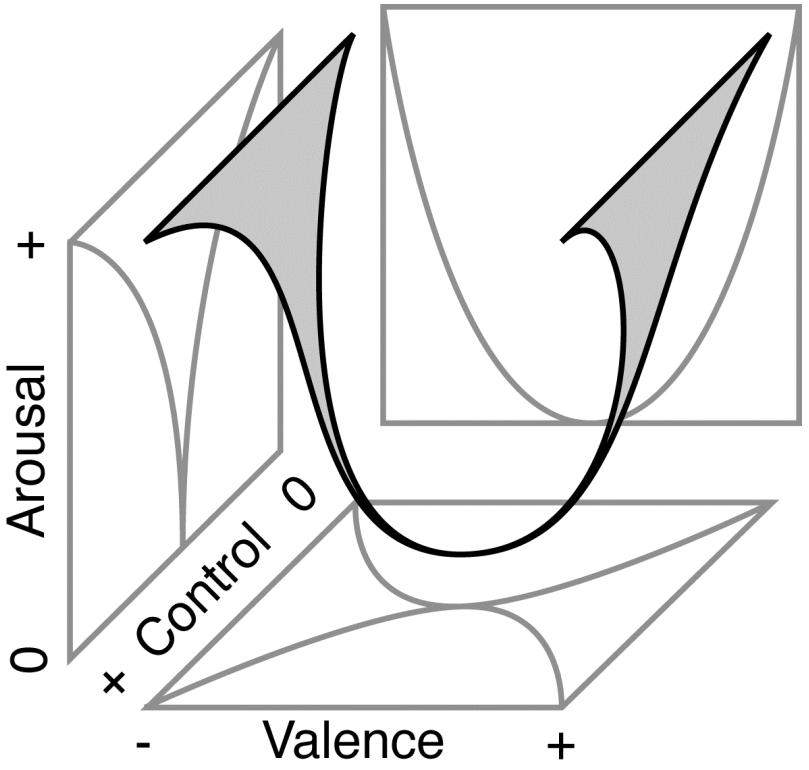
5
humorous
playful
whimsical
fanciful
quaint
sprightly
delicate
light
graceful

4
lyrical
leisurely
satisfying
serene
tranquil
quiet
soothing

1
spiritual
lofty
awe-inspiring
dignified
sacred
solemn
sober
serious

2
pathetic
doleful
sad
mournful
tragic
melancholy
frustrated
depressing
gloomy
heavy
dark

3
dreamy
yielding
tender
sentimental
longing
yearning
pleading
plaintive



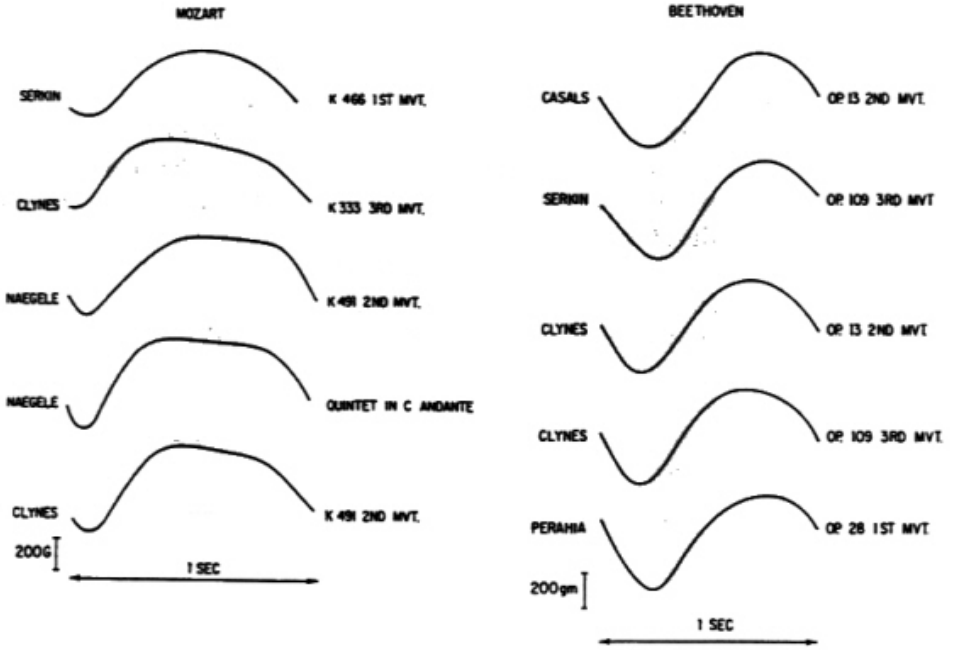


Fig. 1. The motoric composer's pulse measured through conducting on the sentograph with finger pressure, in a seated position, while thinking the music in real time (without sound). Each trace is an average of 50 pulses; tempo was constrained to be MM 60 per minute with a synchronizing light. Shapes are distinctive for each composer, regardless of piece, and of subject, in this group of artists. Reprinted by permission, from M. Clynes (1969). Toward a view of man. In N. Leibovic and J.J. Eccles (Eds.), *Information systems of the nervous system*. New York: Springer-Verlag.

Clynes, M. (1977). Sentics, the touch of emotions. New York: Doubleday Anchor.

Gesture modelling

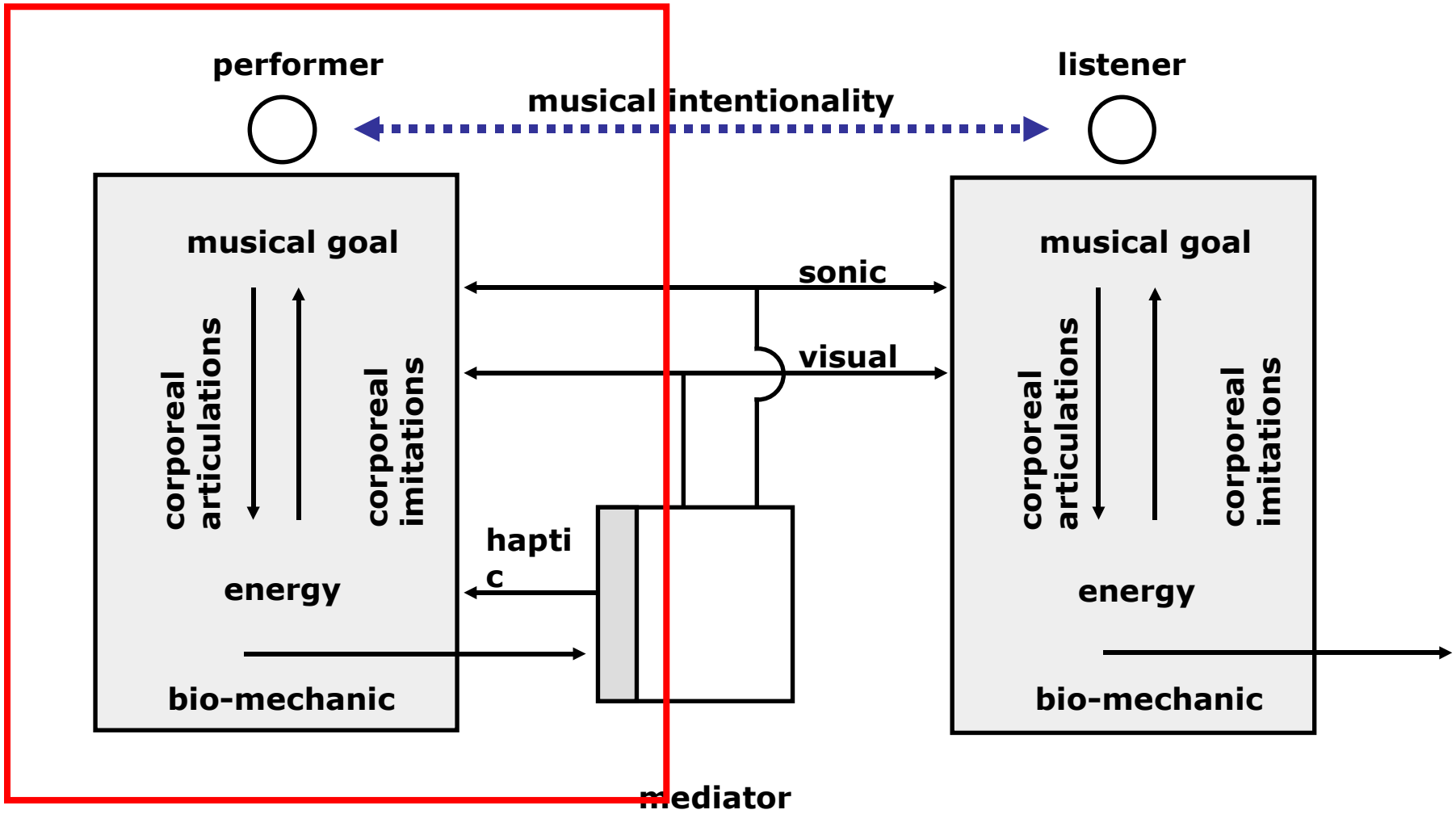
- Coupling perception and action (= sensorimotor coupling at the intentional level)
- Expressiveness in musical performance
- Modelling:
  - Physical modelling
  - Motor theory of perception (Liberman & Mattingly, 1989, Lotto & Purves, 2003)

PART 2: Proposal

Theory of music communication should be able to explain:

1. transition from sound to sense, and back
2. musical intentions (goal-directed action)
3. communication of musical expression…

Musical Communication



Transition sense/sound/sense

Production:

- Corporeal articulations realize mental representation as bio-mechanical energy

Mediation:

- Bio-mechanical energy is translated into sound energy and partly reflected as haptic energy

Perception:

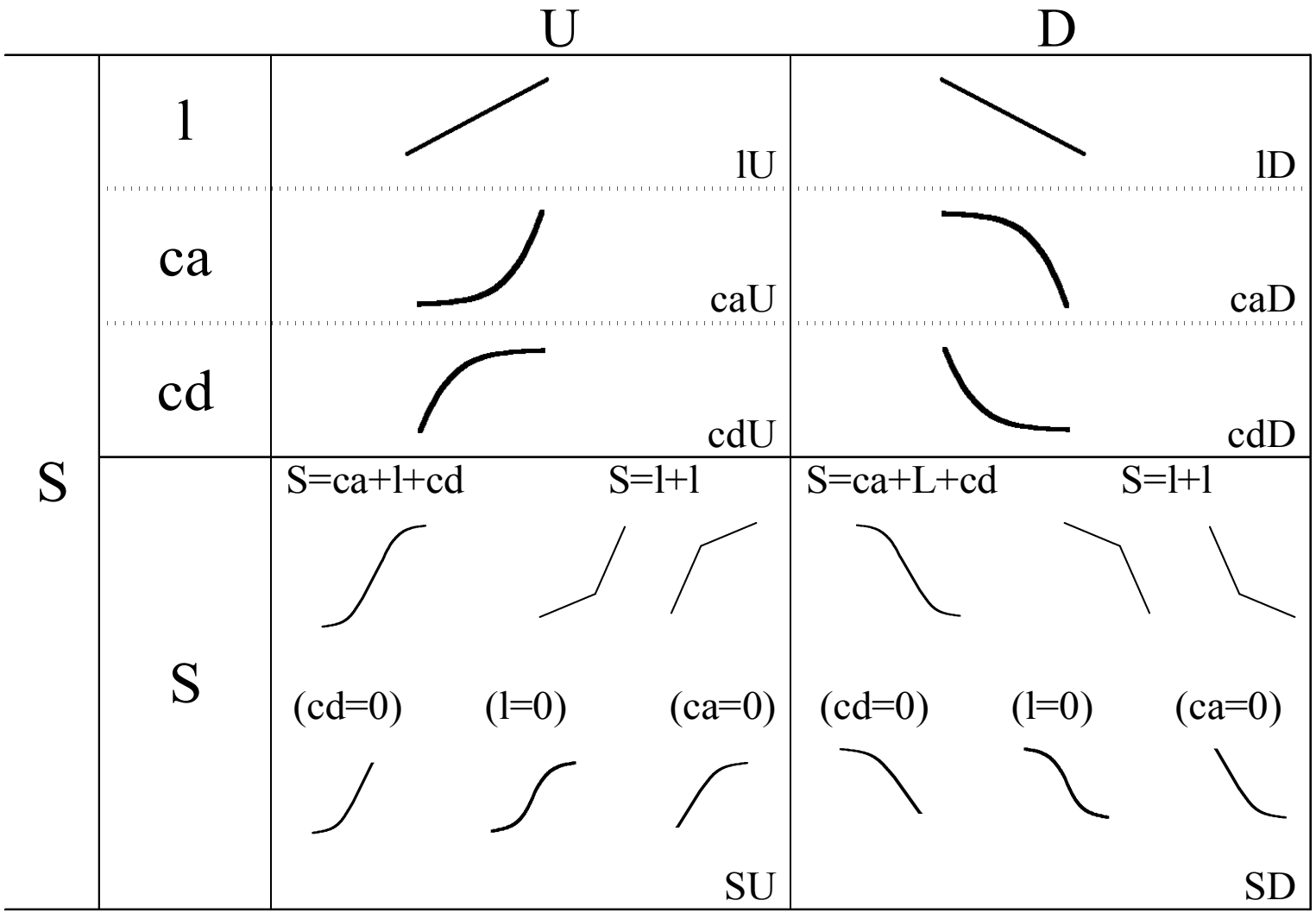
- Corporeal imitations give sense to sound energy

→Human body is natural mediator between mind and matter, mediation technology is partly an extension of the human body

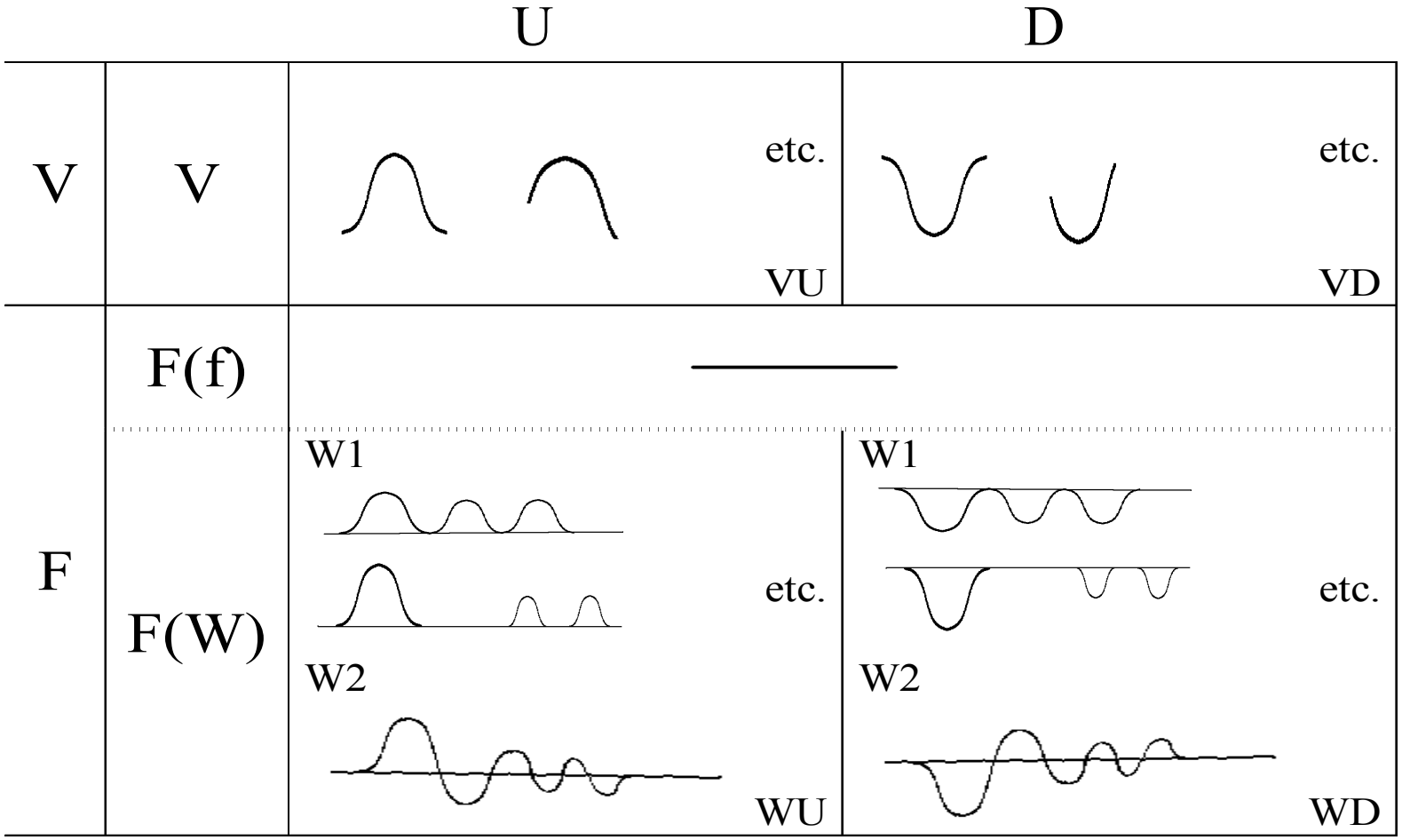
Corporeal understanding

(Henbing Li)

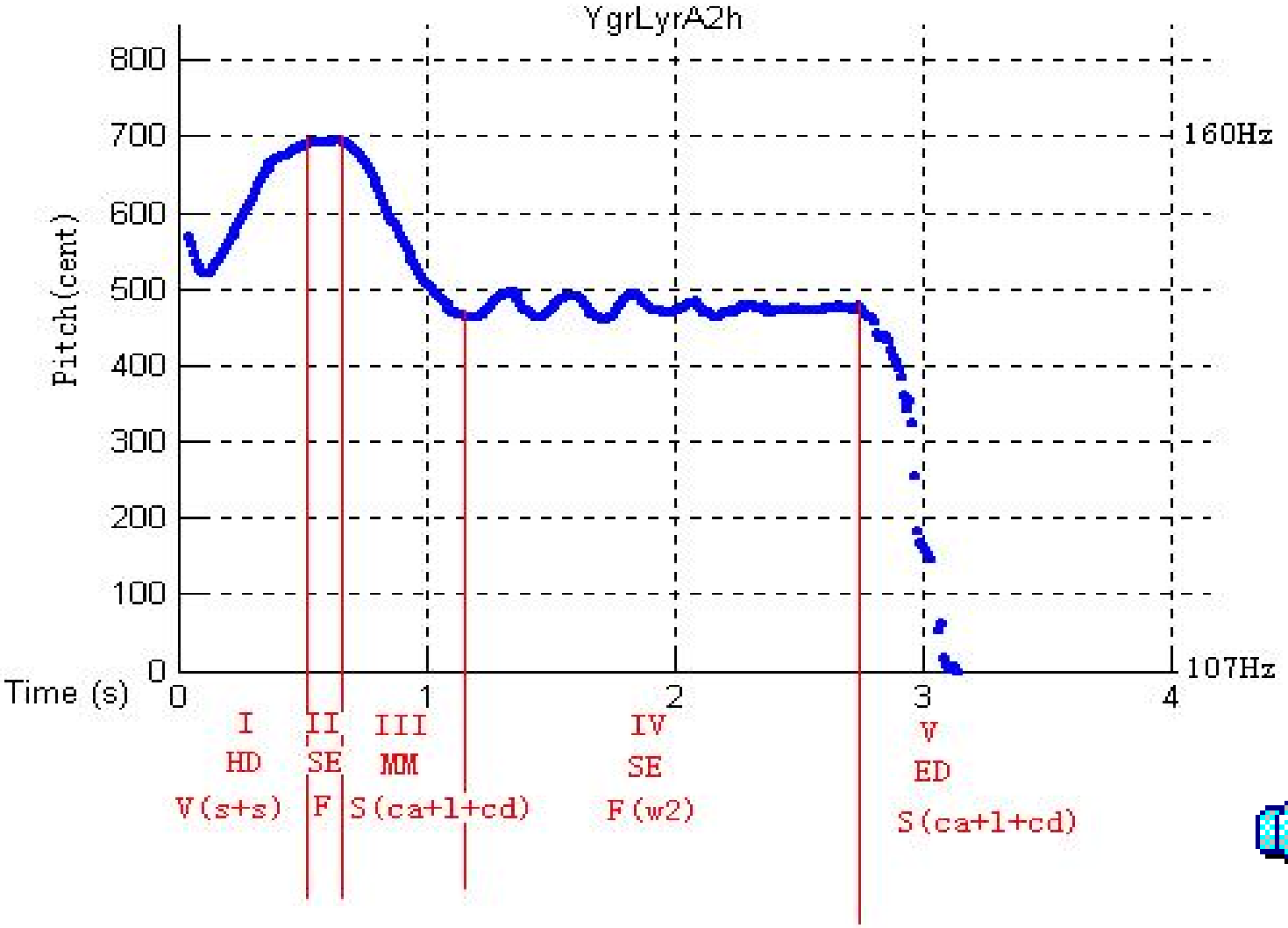
Basic playing forms



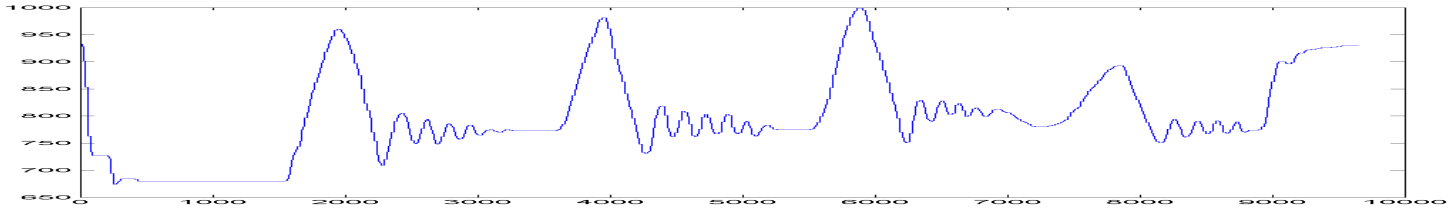
Basic playing forms



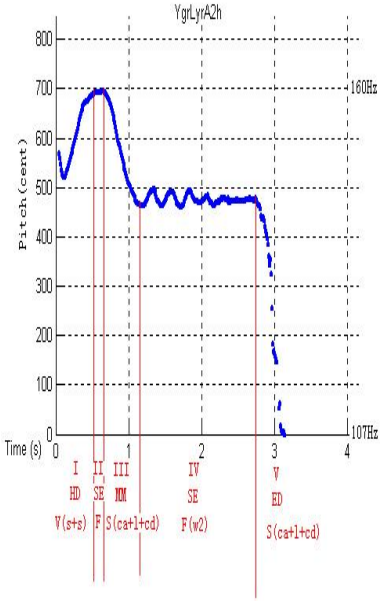
Gestural forms in sound



Motor imitation

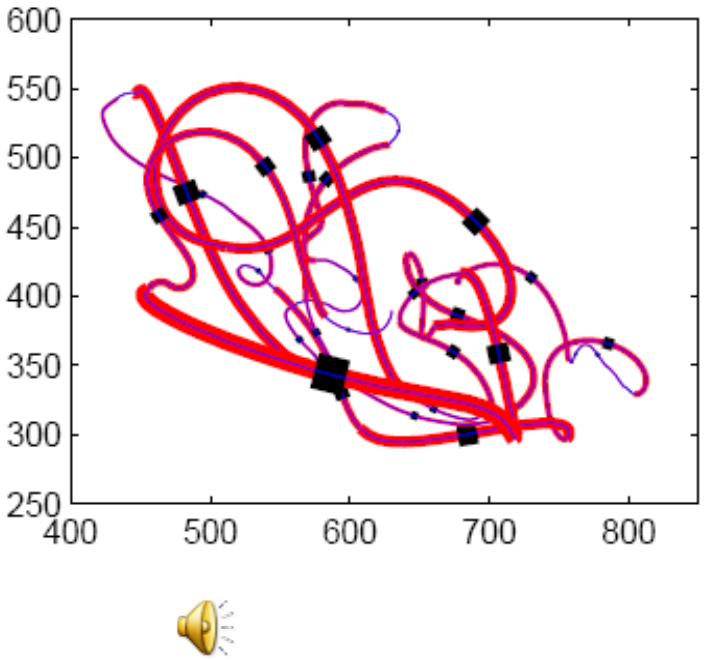


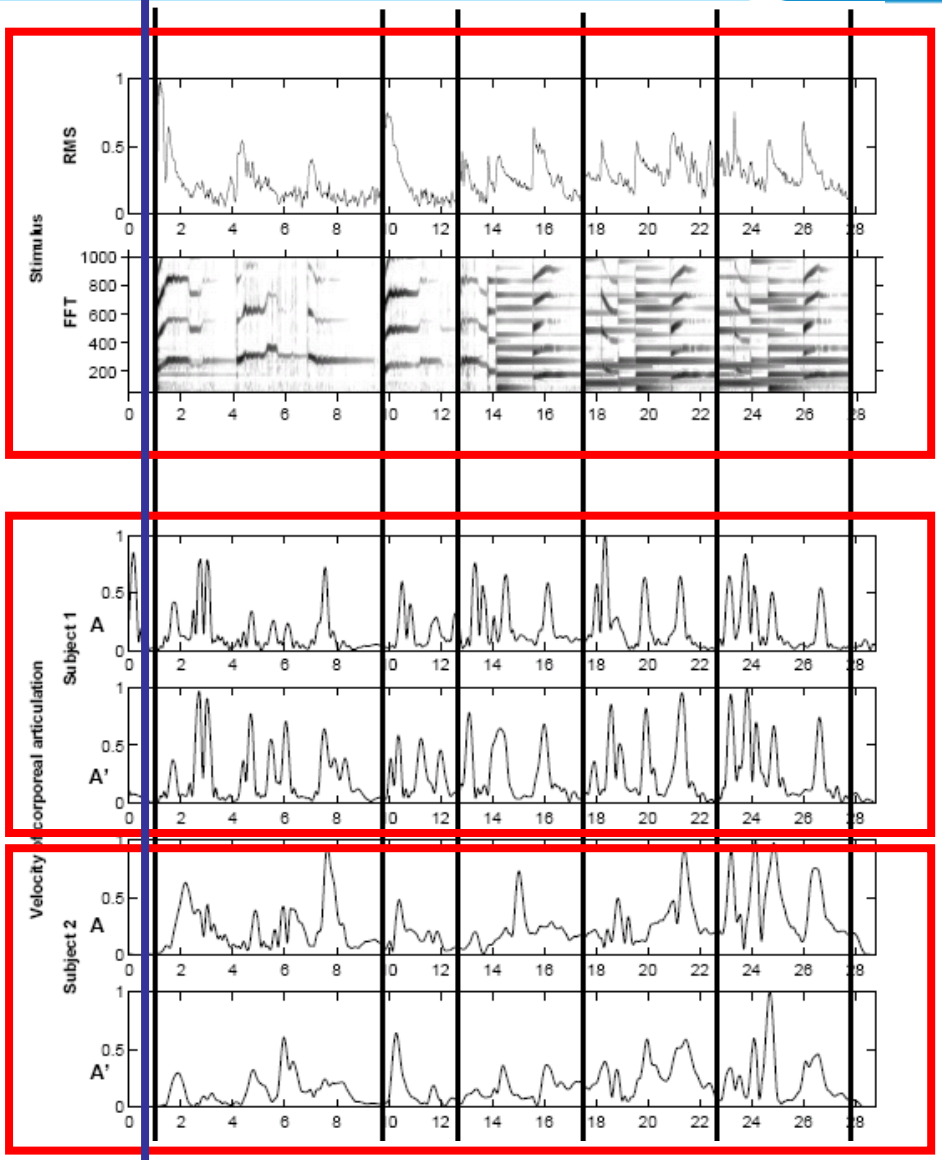
Motor image



Acoustical image

Graphical attuning





Conclusion

- Human body accounts for the transition between musical sound and sense → Human body is natural mediator → Technology can extend this natural mediator
- Sense has been studied from 2 perspectives:
  - Cognition: focus on feature extraction and classification, structural information, and mental processing
  - Beyond cognition: focus on body and technology mediation (cognition is an aspect of this), subjective information (emotion/affect/expression)
- Future: research on the mediation aspect

Conclusion

- Focus on mind rather than body might have been a mistake
- Reason for the mistake: body gives the illusion of non-mediation
- If technology is an extension of our body, then technology should « disappear » as mediator, create this illusion of non-mediation