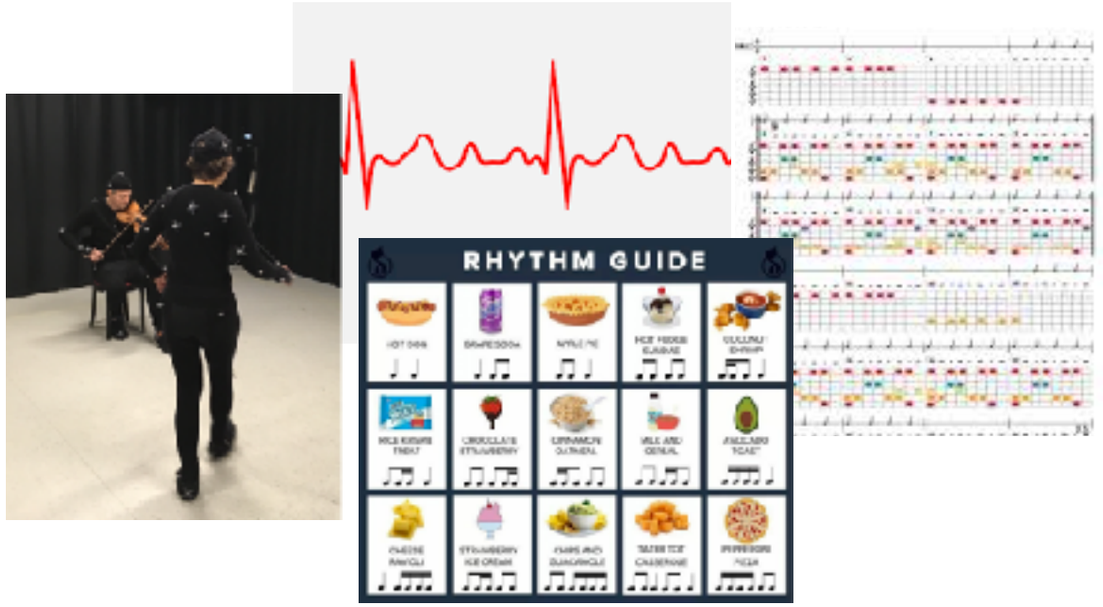
Rhythm & Structure

A view at music theory from the perspective of
Swedish traditional dance music



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[1] This project has received funding from the European Union's Horizon 2020 research and innovation programme under the

Rhythm?

ex 1

I. Xenakis: Pléïades
(1978)

ex 2

Karin Edvards: Kulning
rec. 1949.
Herding calls from
Sweden

on concepts & terminology

”What are we to say, […]when someone talks as is too often the case about a "fast rhythm"?
How can such a blunder be made by a reasonable person? For after all, speeding up only alters movement. If I sing the American national anthem twice as fast as usual, I modify its tempo; in no way do I change its rhythm, since the relationship of note values remains intact.

Igor Stravinsky Musical Poetics (1947)

Background: Swedish fiddle music

with Anton Jernberg
(1984)

Playing for dancing

with Folk dance team
1970s

The mission of the fiddler:
Get the dancers on their feet and make them enjoy moving with the music

Questions from a fiddlers perspective:

What characterizes different types of dance tunes
in Swedish folk music?

What in the music determines what and how the dancers will dance?

many melodies - same dance

~~not primarily the sequence of notes~~

the temporal dimension of music - Rhythm

Rhythm

temporal structure

Gestural rhythm

”rhythm”

- the perception of ’gestalts’ of temporal events
- events are grouped into entities
- rhythmic figures, phrases, motifs, ”free rhythm”

- singular, gestural
- parallel to spoken language - talking, phrasing, prosody, agogics, calls
- Signals
- Prominence in ”speech-like” music: chant, recitative, calls, etheric music
- Expressiveness

Periodic rhythm

”meter”

- the perception of periodicity of temporal events
- events are perceived in relation to a perceived regular temporal grid
- pulse, meter, time, bar, measure, measured rhythm, periods etc.

- plural, repetitive, synchronous
- parallel to walk, run, repetitive work etc.
- Prominence in ”walk-like” music: dance music, trance music, work songs, procession music etc.
- Suggestiveness

Interaction

birds

step

gesture

clock

walk

continuity

Two worlds: physical vs. psychological reality:
-> physical rhythmic structure may influence rhythm perception
-> rhythm perception spontaneous may exist without physical rhythmic structure

”Beats” in Swedish Fiddle music

Sven Ahlbäck: 1985/1995: ”*Characteristic features of dance tunes in Swedish folk music*”
An analysis-by-synthesis approach - an example of a testable music theoretical model

Q: What is most important for what dance is danced in Swedish folk dance,
Gestural rhythm or meter?

A: Meter, since the dance movement does not change with the figures or phrases*

Research question:

Can dance types be modeled only using metrical structure?
What is the minimum requirement of the stimuli to make people dance different dances? Can a ”folk dance metronome” indicate dance categories?

Approach:

Theory/Model constituting an hypothesis -> questions:
- To what degree is there a relationship between perception and physical stimuli?
- stylistically valid?
- cross-culturally valid?
evaluated experimentally by analysis-by-synthesis approach

Metrical structure (Ahlbäck 1986/1995/2004)

- Pulse
- Tempo
- Pulse layering (superimposition/hierarchy)
- Measure/Time/Hyperlevels
- Metrical articulation
- Beat subdivision
- Interaction Meter - Rhythm - Form

N.B. Many alternative theoretical and disciplinary approaches!

Check out e.g.
London (2004)
Fraisse (1982)
Gabrielsson (1993)
Clarke (1999)
Patel (2014)
Arom (1991)
Lester (1986)
Yeston (1976)
Lerdahl & Jackendoff (1983)
Honing et al (2018)
…
don’t miss MIP-Frontiers professors research in rhythm/meter, e.g.
Gouyon & Dixon (2005)

Metrical structure

- Pulse — a perceived stream of periodic articulations of time, of regulative power

  beats are the articulation points in the pulse stream

  pulse refers to the perceived lowest levels of regulative periodic articulations of time, the atomic levels

- Tempo — tempo is the frequency of occurrence of beats - pulse frequency (speed)

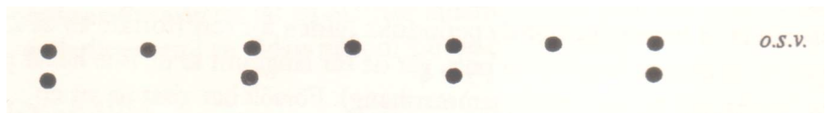
  preferential tempo range

Model specifics

- sub-pulse & hyper-pulse periodicity
- non-isochronous pulse, timing of pulse
- non-exclusive perceptual approach
- single pulse level considered metrical structure

- Pulse layering — the perception of simultaneous related pulse streams (pulse superimposition)

- ”even” pulse layering — even ratio, higher level always coincides with lower level: 2:1, 3:1 etc.



- ”uneven” pulse layering — uneven ratio, regular concurrence: 3:2, 4:3 etc.

- ”phase shifted” pulse layering — same tempo, never coinciding 1:1 etc.

- central pulse level (tactus) — generally main pulse level of synchronization, highest regulative power (e.g. 3:2 vs 2:3 difference)

Model specifics

- tactus not an absolute must, central pulse complex - compound attention possible
- polymeter - not exclusively cometric vs countermetric
- pulse perception different from perceived pulse subdivision

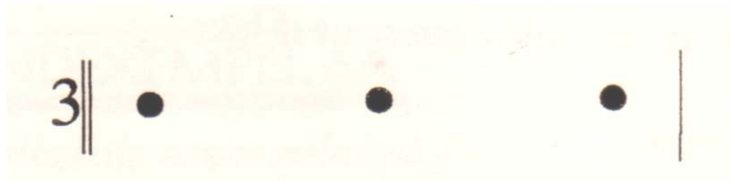
Examples of layered pulse structure

Lully, The campaign
-even 4:2:1

Butour Ngale
- uneven 3:2

Bob Marley: On-off
- shifted 4:2:2

- Time/Measure perceived periodic grouping of pulse



Time/Measure is not fundamental - we can perceive pulse without time

Phase of time/measure is determined by the most differentiating accentuations in the pulse stream, e.g. the beat perceived as most stressed

Phase of time/measure generally spontaneous, but not fundamental

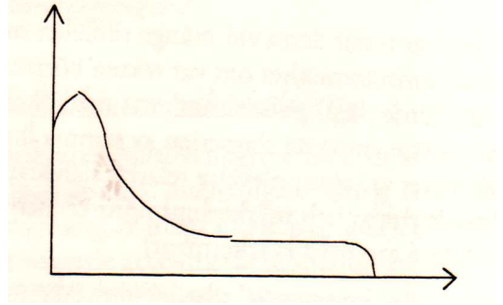
Model specifics
- Time/measure can be multilayered
- Time/measure is not always present
- Hypermeter - supertime when regulative periodicity is perceived
- Compound meter - sometimes perceptual

- Metrical articulation perceived & phenomenal articulation of pulse

Metrical articulation refers to perceived and phenomenal marking of beats. It is a quality of the beat articulation.

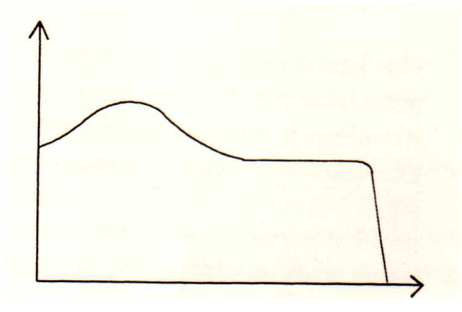
There are two main types of metrical articulation, acute and grave accent (’accent’ and ’phenomenal stress’)

acute accent — a short, light, sharp articulation of an event — da’



up

grave accent — a long, heavy, round articulation of an event — i_



down

Grave accent - step, Acute accent - jump

Grave accent (often) downbeat, acute accent - upbeat (e.g. swedish fiddle music)

Articulation qualities - can be combined - have degrees

Any physical differentiation can serve as source of accent perception, e.g. harmonic

Downbeat?

All variants equally culturally valid!

What determines downbeat?

Any differentiating parameter giving structural prominence recognised within a certain cultural musical practice will do :-)

Priming is powerful!

Downbeat?

Ex. Tongoli Fumbo Adhola Music: Fur ber
Tongoli harp

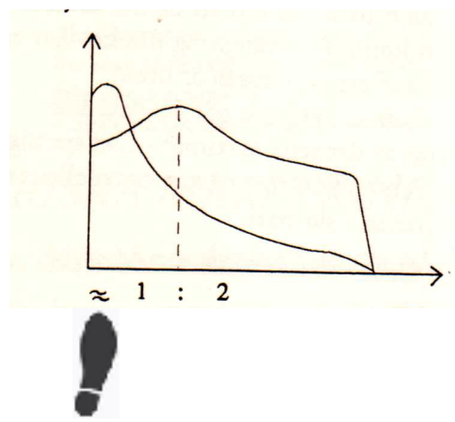
Downbeat may not be a necessity - there are musical styles where perception of metrical phase may not be significant

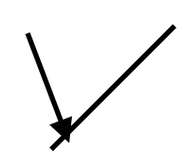
- Combined metrical articulation

Example 1, Hjort Anders Olsson Polska ”Lilla Ddur”

How does it sound it terms of da’ and i_?

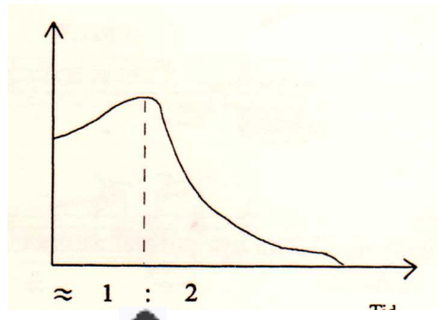
roll/swing accent bounce da’i_

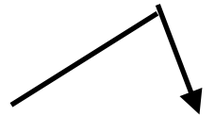




down-up

tie accent slide-in di_a`

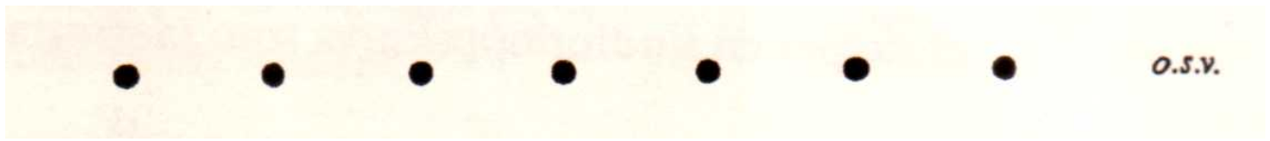




up-down

and also…
syncopation as metrical accentuation

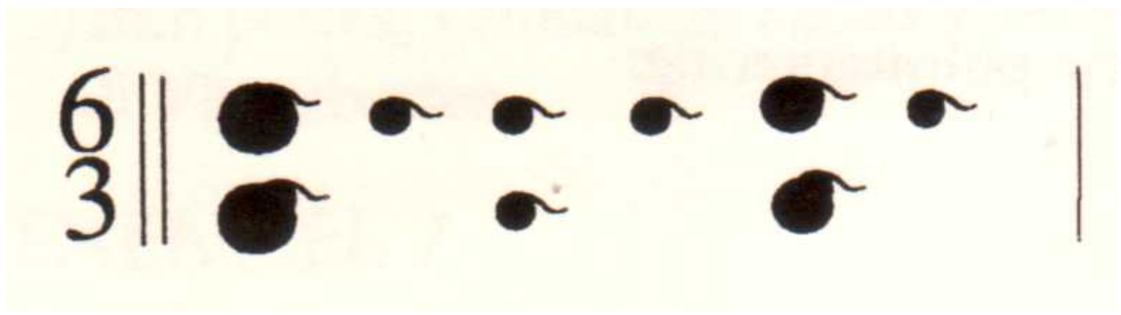
- Evaluating analysis-by-synthesis
  The ”polska” metronome: Tune type generation



a) pulse - flat sine wave notes

b) + ”roll” accent envelope

c) + even pulse layering double tempo



d) + measure period accentuation

”Even polska” -
”Slängpolska"

Evaluation

- 3 groups of folk dancers (15 in each, skilled -> amateur level)

Results:

- Dancers could detect the difference between tune-types, adapting their dance movements
- ”Polska metronome” was sufficient
- The dancers did not think the metronome produced ”good dance music”!

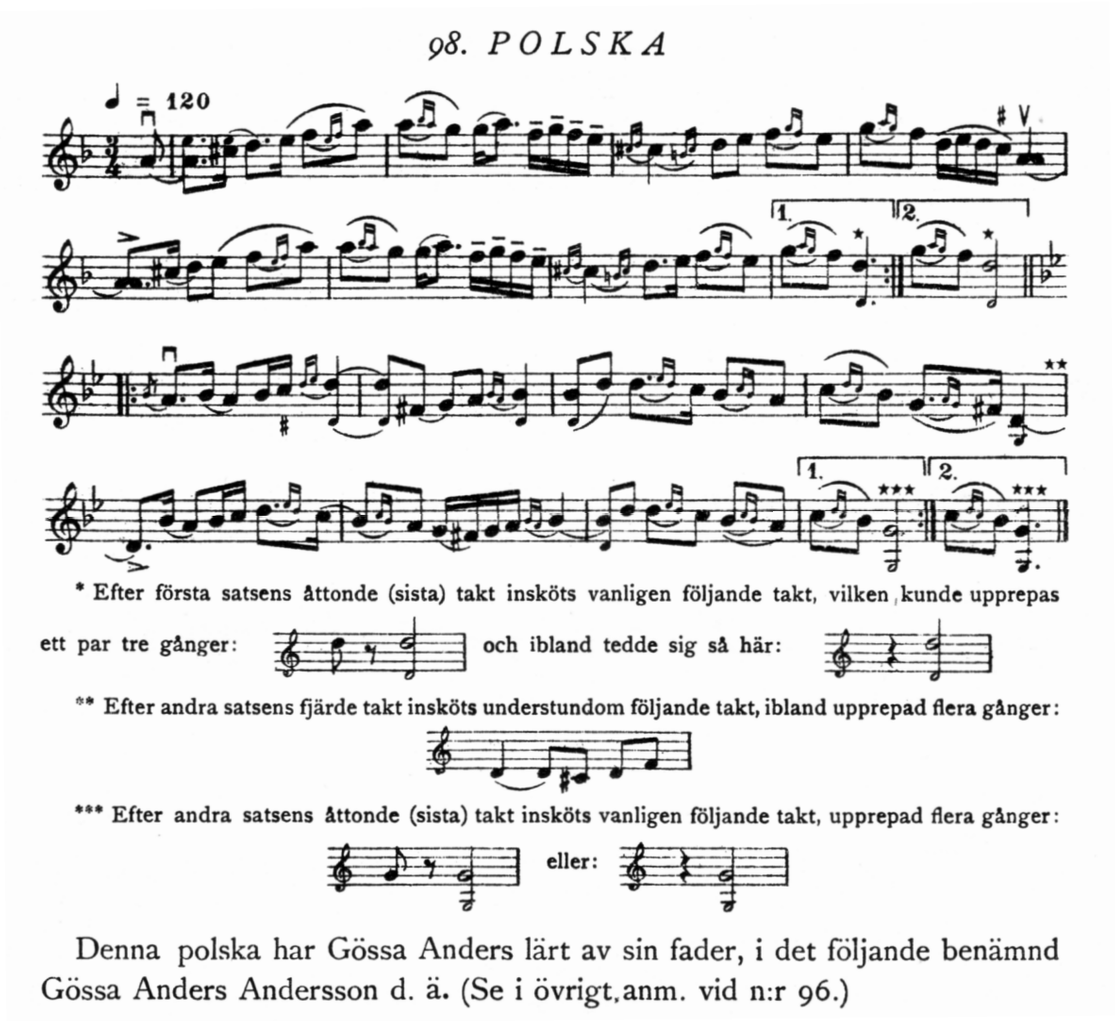
- ”Dull”, ”static”, ”one-dimensional”
- ”I love the melodies”, ”the metronome is not inspiring”
- ”I dance with the melody phrases and figures”

Analytical approach - applying a music theoretical model

- How is musical rhythm & meter notated - represented?
- Challenging music notation conventions from the point of view of metrical analysis:

  - Does music notation represent ”ground truth” for rhythmic & metrical structure?
  - What does different notation principles represent?

Vallåtspolskan played by Gössa Anders Andersson, Orsa



98. POLSKA

♩ = 120

* Efter första satsens åttonde (sista) takt insköts vanligen följande takt, vilken kunde upprepas ett par tre gånger: och ibland tedde sig så här:

** Efter andra satsens fjärde takt insköts understundom följande takt, ibland upprepad flera gånger:

*** Efter andra satsens åttonde (sista) takt insköts vanligen följande takt, upprepad flera gånger: eller:

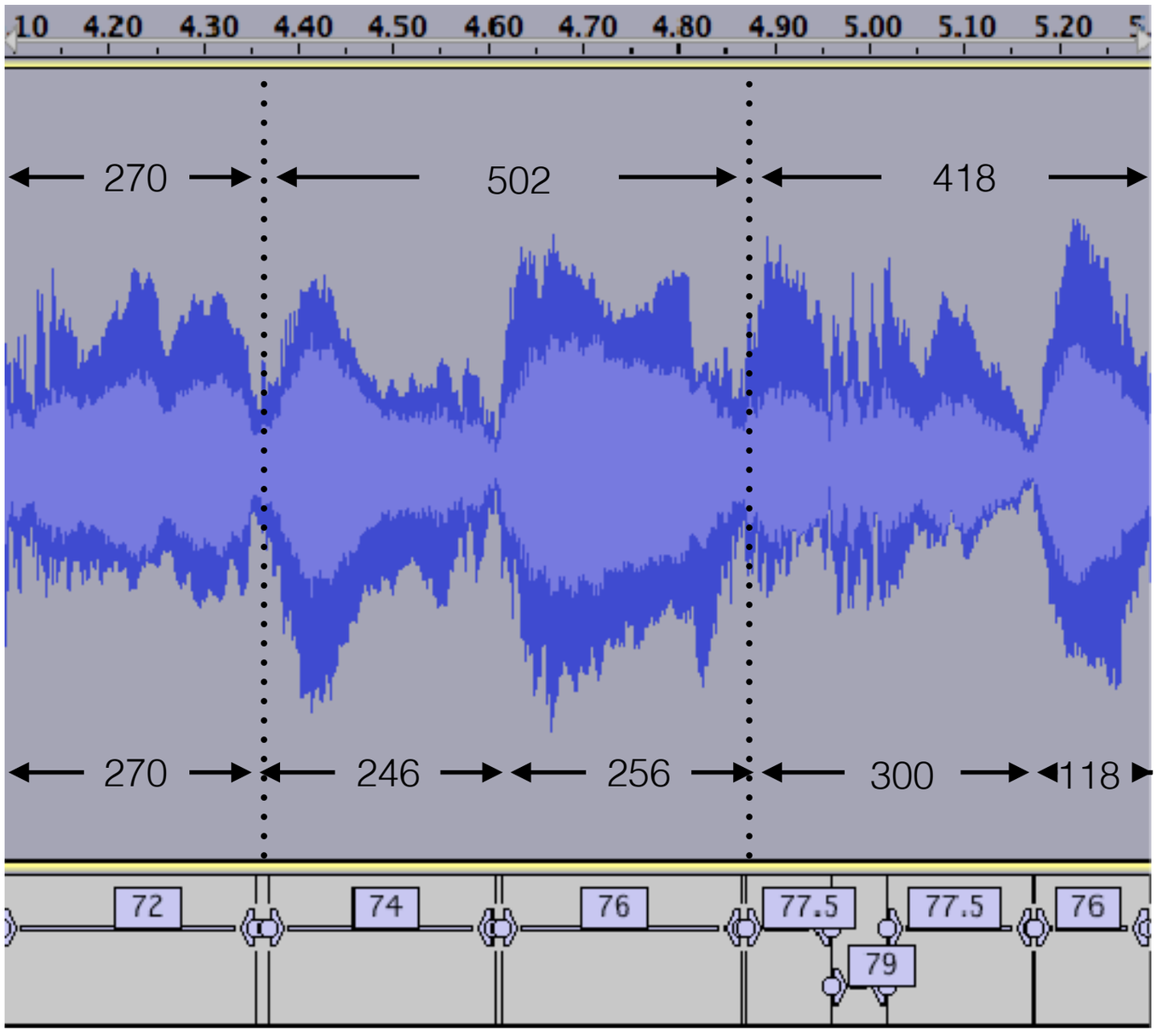
Denna polska har Gössa Anders lärt av sin fader, i det följande benämnd Gössa Anders Andersson d. ä. (Se i övrigt anm. vid n:r 96.)

Notation from
Svenska Låtar
N. Andersson
(1922)

Gössa Anders playing

MIDI Playback of notation

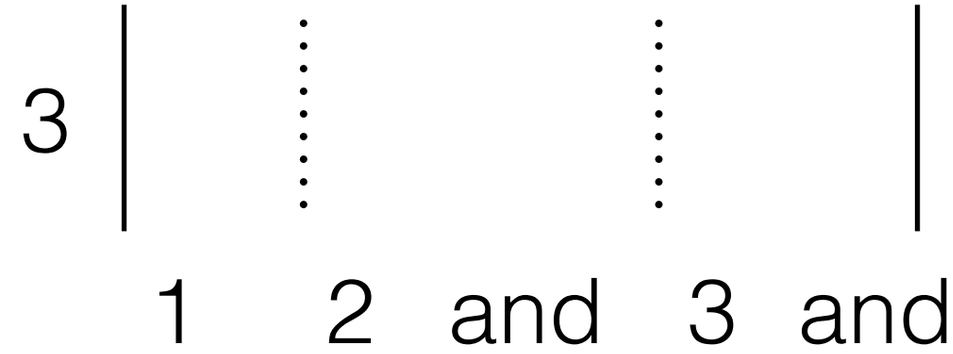
Vallåtspolskan measure 3



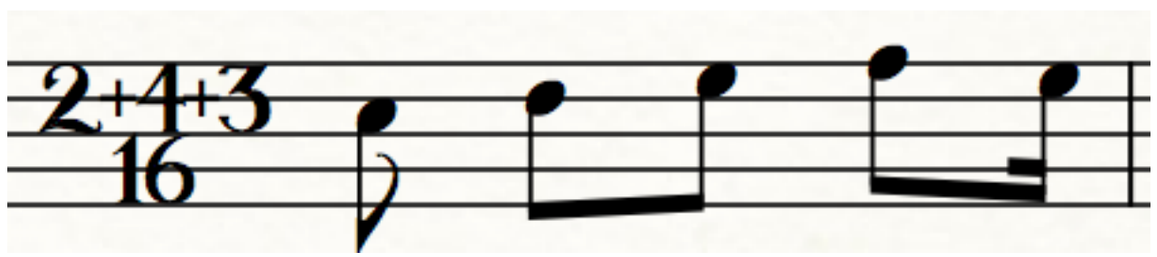
Rhythmical and metrical principal structure

Principal tone duration proportions

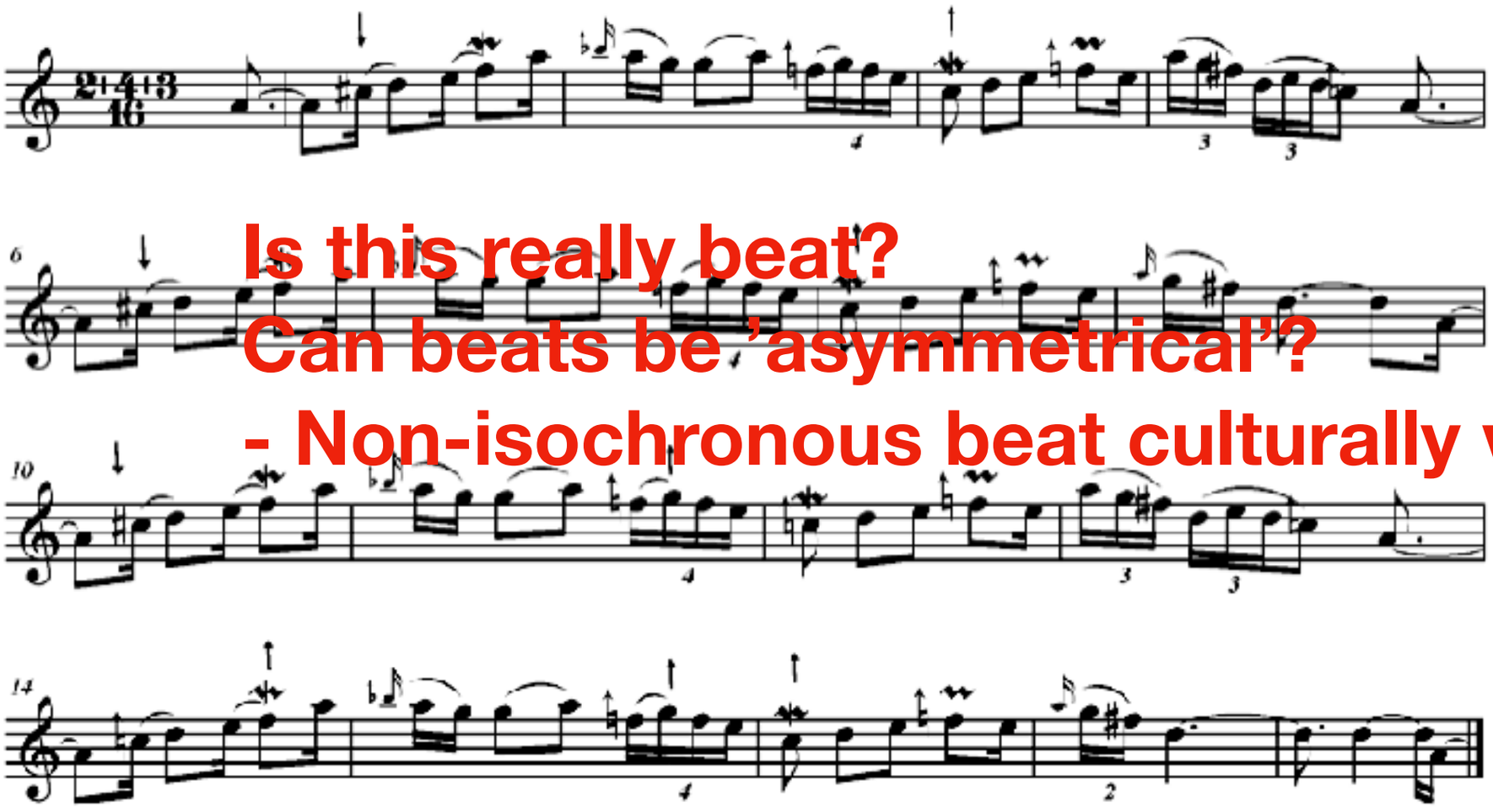
Beat proportions



Notating the rhythm



”Asymmetrical Beat”
Gössa Anders spel av Vallåtspolskan



Is this really beat?
Can beats be ’asymmetrical’?
- Non-isochronous beat culturally valid!

- Music notation is *mostly* reflecting interpretation principles or perceptual/cognitive principles - not a reproduction of music
- a ”recipe” for music performance or
- a ”map” of music cognition

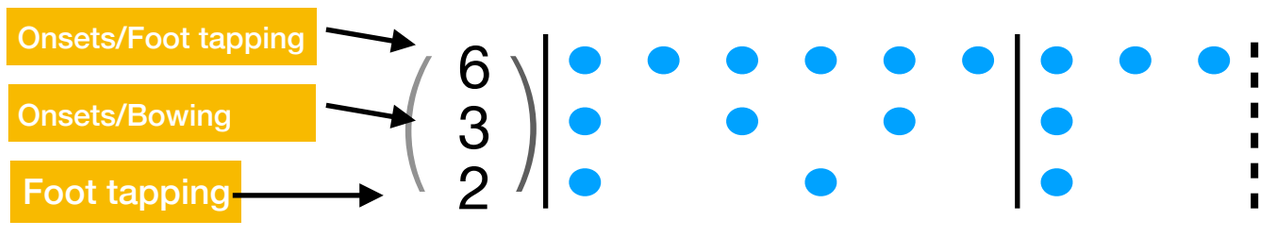
The metrical model as an analytic tool

- Challenging Music Notation:
  What can we learn by looking at music from the view-point of the metrical analysis model?

Example Gangar A

Nordafjells after Austegaard (excerpt, private recording)

Metrical structure?

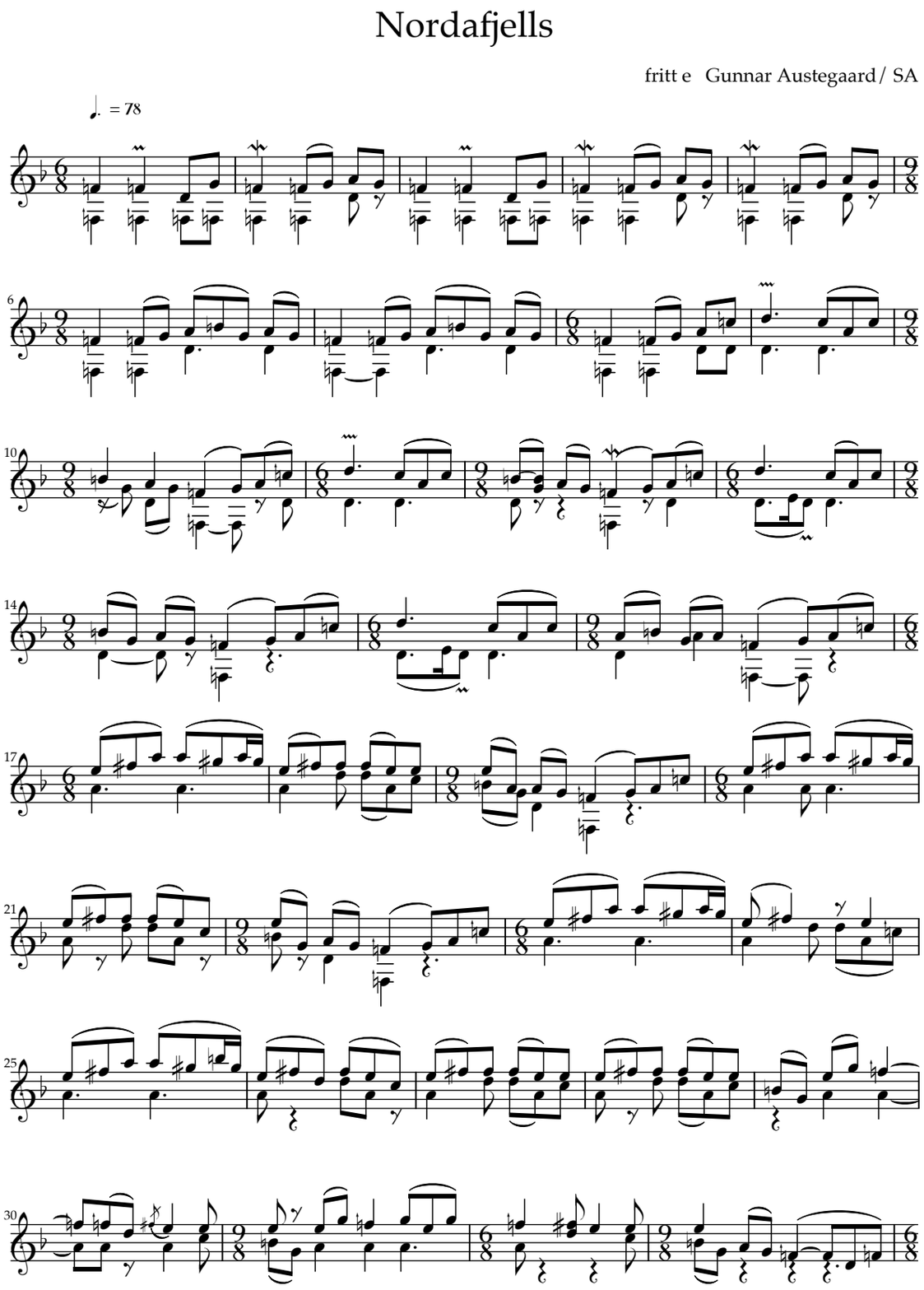


- Bow vs Feet - Implied ”uneven” pulse layering
- Melodic form gives varying measure period indication ->
  - pulse but no regular measure time - measure periodicity insignificant?

Subject to debate:
cf Blom & Kvifte (1986):

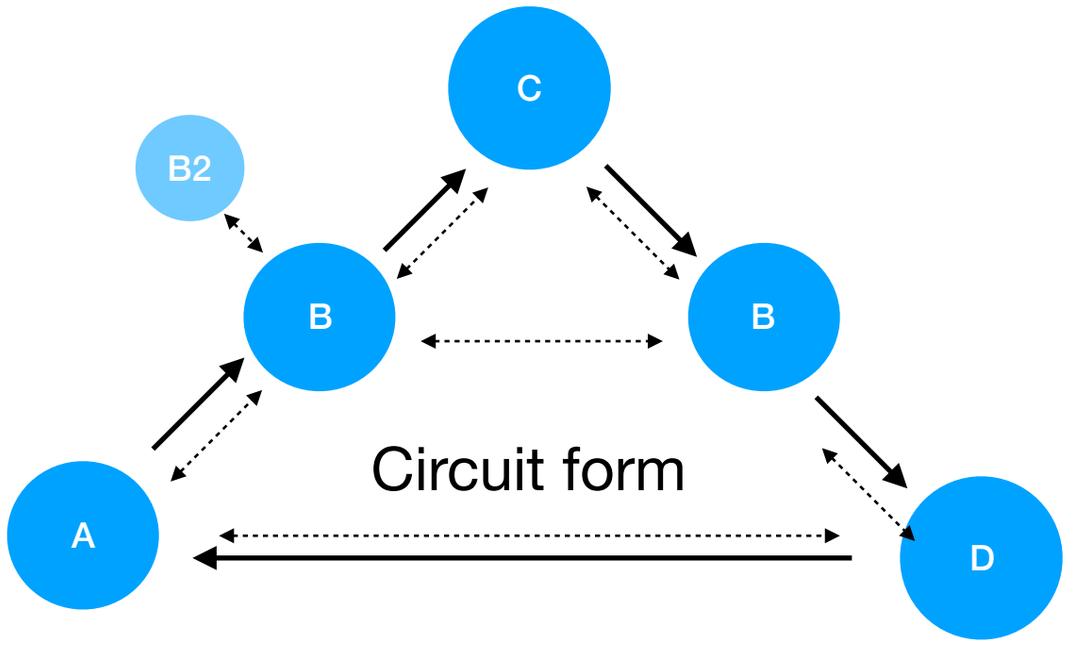
”One can use only one single meter at a time. […] one can choose to perceive it in 3/4 or in 6/8, but it is impossible to perceive both meters simultaneously”
”One can only understand meter as an exponent of dance movement”

Even non-standard / extended western music notation has limitations…no polymeter, no clear representation of form…

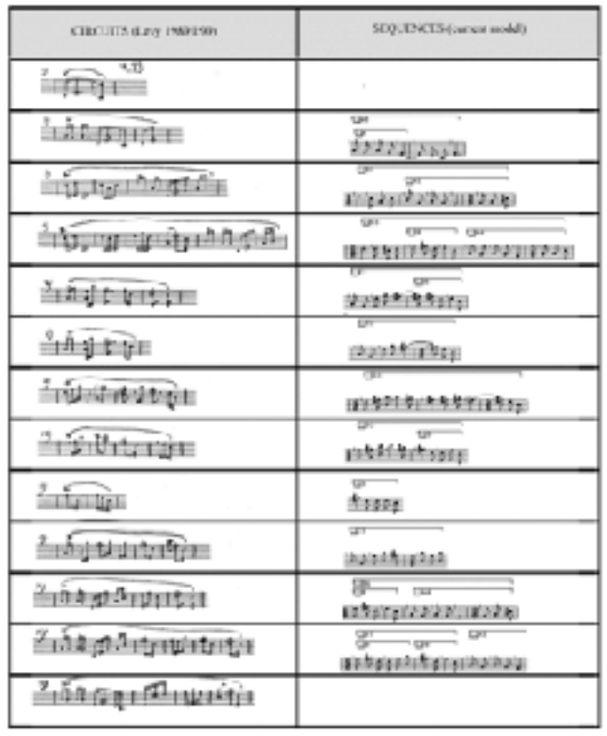


Alternative representations

Levy (1983)
Nordafjells form by progression between ’circuits’



Constant transformation
Short-cuts possible



Many theoretical concepts of form and structure:
Examples:

Kubik: Theory of African Music
”music as interlocking patterns”
humans interact in music & dance

Lerdahl & Jackendoff:
A generative theory of western music

Lerdahl & Jackendoff (1983): A generative Theory of Tonal Music

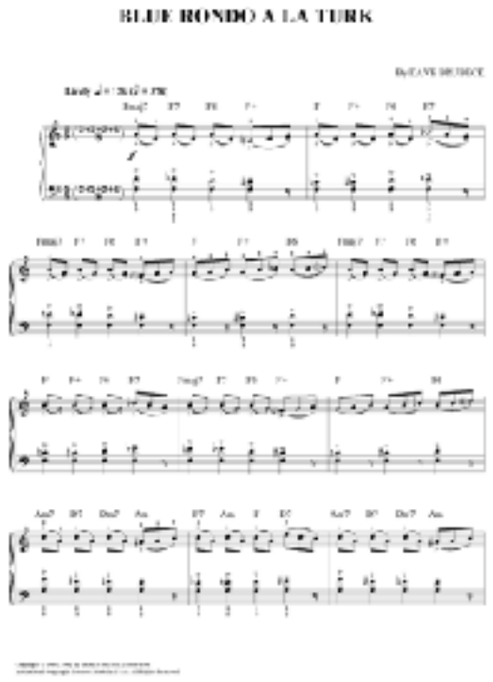
Formalized music theory -> Implemented, tested, disputed (see e.g. Temperley 2001)

Claim: Grouping (cf Gestural rhythm) and Meter are perceptually independent

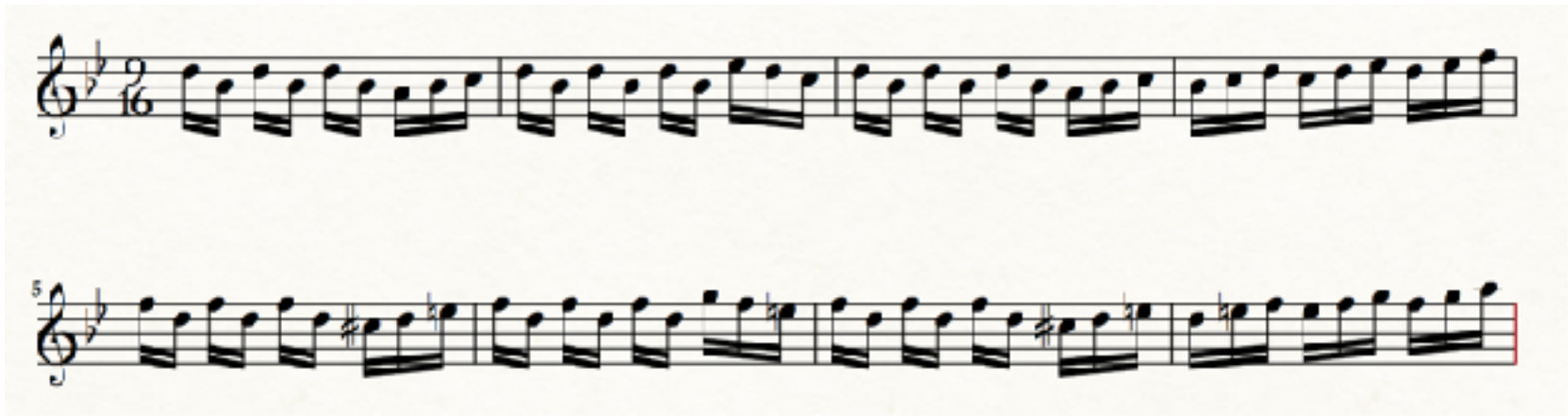
Example

- Is there any grouping?
- Is there any metrical structure?

Performance midi, Adapted from Brubeck: Blue Rondo a la Turk



Result from analysis based on melodic pattern finding -> ”grouping” implies meter



C.f. Raffael Caro’s presentation about Indian Classical music: The relationship between small- and large-scale temporal structures might be very different in different musics.

Implications for MIR?

- There are - at least - as many theories about rhythm as people who study it….It might be valuable to question even fundamental theoretical concepts
- One more time: Our perception, cognition and representations of musical rhythm is influenced by ideas and practices - for example in the form of music theory - which exists in a given cultural sphere. Thus, it might be important to consider the theory that influence our questions and take some time to qualify your questions.
- Applying and testing theoretical concepts can sometimes reveal new insights, develop theory and make models more robust.
- It might be worth not only testing models on the most frequent styles of rhythm and cross-culturally; the particular and seemingly odd styles might give more robust models.
- It might be worth asking if tempo, metrical phase/downbeat etc. is a relevant feature of the music in question. Can articulation by pitch structures be relevant? Musical form?
- Is the temporal structure of the music possible to determine by the audio alone? To what degree is movement, dance, vision etc. necessary to perceive rhythm in the music in question?
- There is a lot left to do in the field of modelling rhythm and structure!

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