



Melodic Similarity



CS 275B/Music 254

"Natural history" of similarity

- ▶ ***Concept of similarity*** fundamental to organization of most art music
- ▶ ***Types of similarity*** widely variant
- ▶ ***Roles of similarity*** widely variant
- ▶ Similarity in art music is **intentional**

Contour matches (accidental)

- ▶ Target:

- ▶ Chant: “Lucis Creator”



- ▶ Some hits:

- ▶ Bach WTC



- ▶ Bizet: *Carmen*



- ▶ Saint-Saens: *Carnival* (via Offenbach)



- ▶ Mozart: Symphony No. 41, IV



Melodic “Invisibility” Factors

- ▶ **Elaboration** of something simple
- ▶ Compound melodies (monophonic)
- ▶ Psycho-acoustic tricks (polyphonic)
- ▶ Rotating melodies
- ▶ **Ambiguous** foreground/background
- ▶ Metrical **ambiguity**

Elaboration

Bach, Art of Fugue (after Wiering et al.)

Contrapunctus I, alto.



Canon per Augmentationem in Contrario Motu. soprano. EMD 5.55284; PTD 5.90789



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Classic features of melody: symbols vs humans

- ▶ Eerola et al, MP (2001): **Statistical vs perceptual** melodic similarity
 - ▶ Material used: Finnish folk songs
- ▶ Frequency distributions (symbols)
 - ▶ Tones
 - ▶ Intervals
 - ▶ Durations
 - ▶ Two-tone transitions
- ▶ Frequency distributions (listeners)
 - ▶ Tessitura
 - ▶ Mean pitch
 - ▶ Rhythmic activity
 - ▶ Rhythmic variability
 - ▶ Melodic predictability

Recency, Latency (Music/Linguistics)

- ▶ Mario Baroni, Carlo Jacoboni, et al.
 - ▶ (1984 et al.)
- ▶ Melodic kernel
 - ▶ Tessitura
 - ▶ Start and end points, by phrase
- ▶ Repertories
 - ▶ Legrenzi cantatas

Tessitura; Kernel



Folksong research methods

- ▶ Main technique: scan phrase endings, the compile “footprint” of overall scheme
- ▶ Essen analysis tools (c. 1991)

"Der Mai tritt ein mit Freuden"

6: *REG* [Europa, Mitteleuropa, Deutschland, Niederrhein]
 7: *KEY* [Z1262 08 A 3/4] ZZ [8]
 8: *MEL* [-5_ 1_ 231 -5_-3 -4-5 -6_-71-6
 -5_-4_-3_-4_-6_-5-4 -3-51_3_ 321_-7_
 1_12_3_1_5_ 2_1_-7_ 1_-6_2_-7_-5_-5_
 -6_-71-6 -5_1_3_ 321_-7_ 1_//]

Der Mai tritt ein mit Freu-den, es__ flieht der Win-ter

Kalt die Blüm-lein auf der Hei-den, die blü-hen man-nig-

Ein Rö-se-lein zar-te, von Far-be so schö-nas

blüht in mei-nem Gar-ten, vor al-len ich's krön'.

9: *MOD* [HEPTATONIC IONIAN]
 10: *ACC* [1-5_-6-5_-4-3_31_32_1-7_-6-5_31_]
 11: *FOR* [...]
 13: *FCT* [Natur und Welt]

Muellensiefen: Algorithmic vs Human Judgment

Works by Passion Fruit



Features:

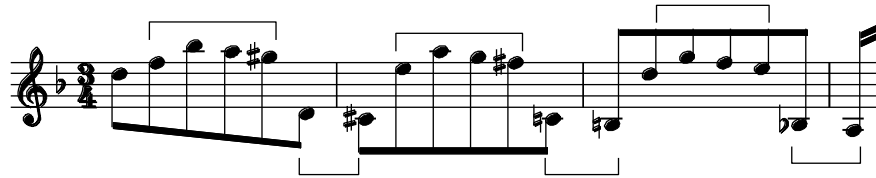
- intervals
- contour
- rhythm
- harmony
- recurrent motifs

- Repertory: popular
- Data: MIDI
- Processes include:
 - contour generalization
 - aliasing
 - fuzzification

Class	Intervals	Name
-4	< -7	Big leap down
-3	-7, -6, -5	Leap down
-2	-4, -3	Big step down
-1	-2, -1	Step down
0	0	Same
1	1, 2	Step up
2	3, 4	Big step up
2	5, 6, 7	Leap up
4	> 7	Big leap up

Perceptual tricks

▶ Compound melody

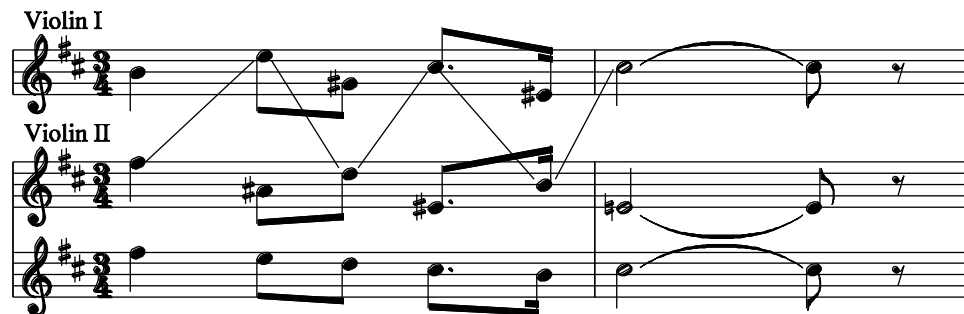


One voice that
we hear as two

▶ Distributed melody

Violin I

Violin II

Two musical staves, Violin I and Violin II, in treble clef, key of D major (two sharps), and 3/4 time. The Violin I staff contains a melody with a long slur. The Violin II staff contains a similar melody. Lines connect corresponding notes between the two staves, showing how a single melodic line is distributed across two voices.

Two voices that
we hear as one

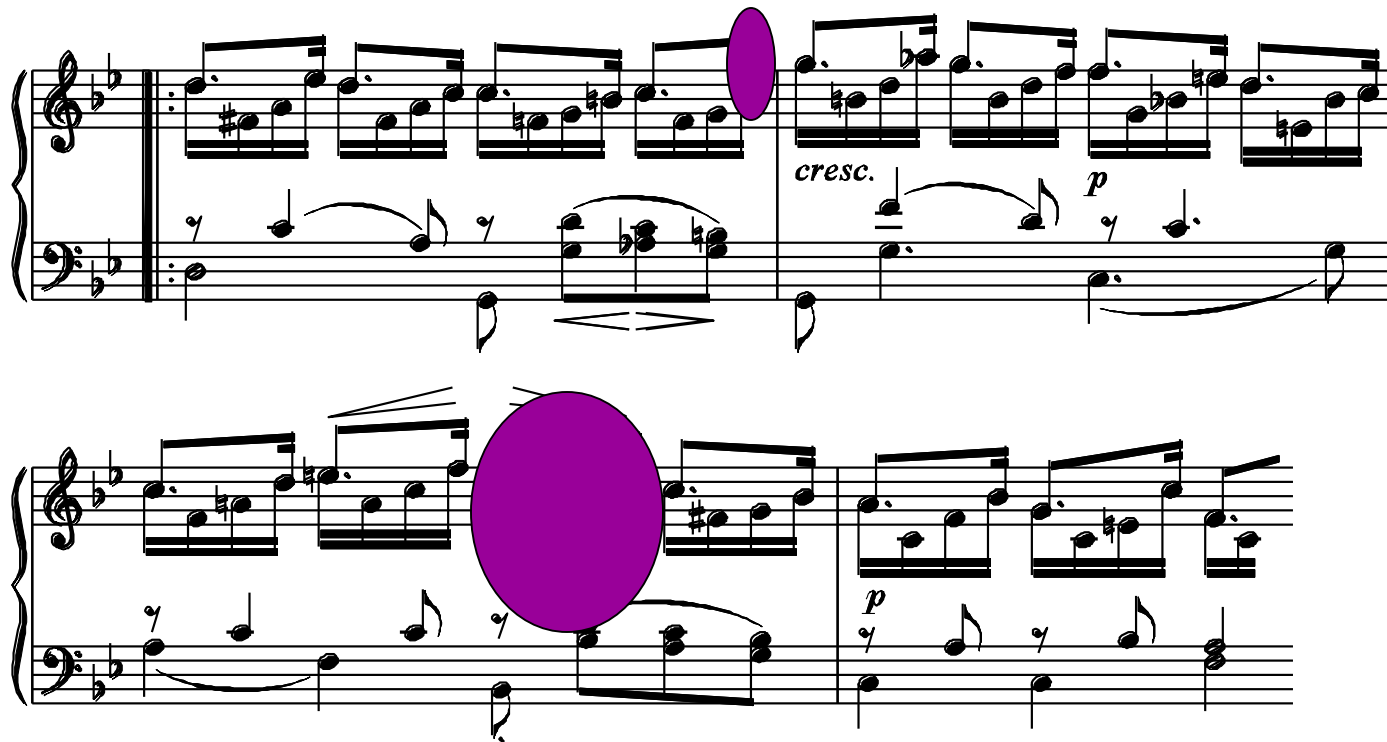
Rotating melodies

The image displays three systems of musical notation for a string quartet. The first system consists of a single staff with a treble clef and a key signature of one sharp (F#). The second system consists of two staves, both with treble clefs and a key signature of one sharp. The third system also consists of two staves, both with treble clefs and a key signature of one sharp. Purple arrows indicate the rotation of the first melodic line from the first system to the second, and from the second to the third.

B, T, B, T; A, S

Haydn: "Archduke" String Quartet

Perceptual tricks: Ambiguous foreground/background



Schubert

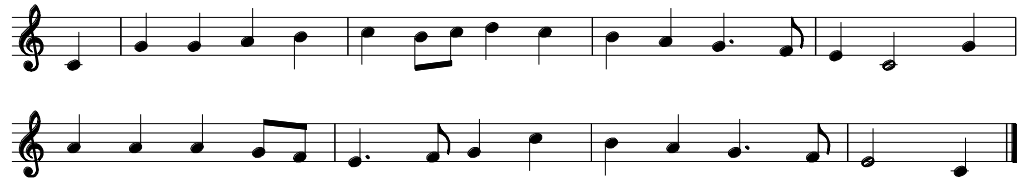
Perceptual tricks: Metrical ambiguity



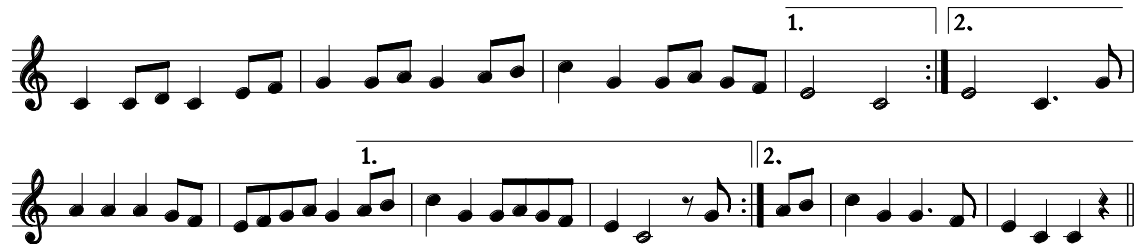
Tune-family studies (social cognition)

▶ Morris tune

▶ Weelkes (1608)



▶ Jones (1802)

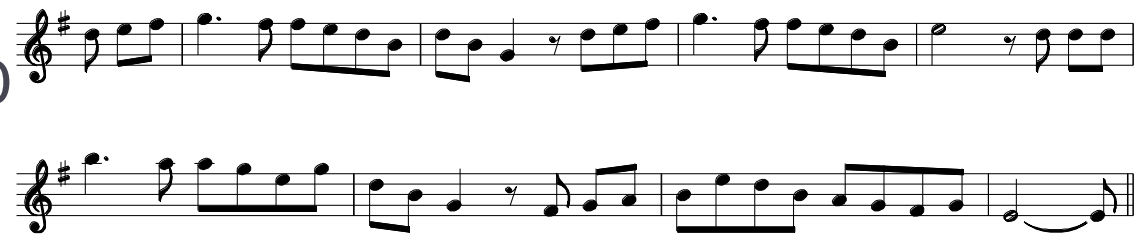


▶ Londonderry air

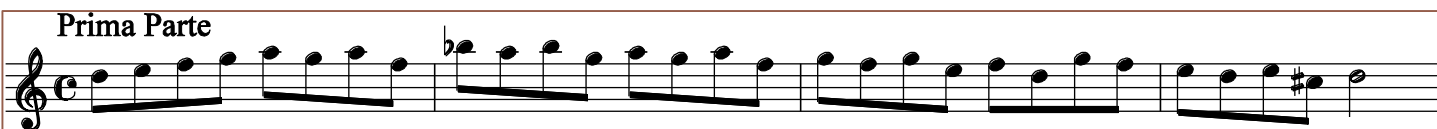
▶ Verse part: 1704



▶ Chorus part: 1850



A similarity study: Ballo di Mantova



Ballo di Mantova

De ge - bo - den da - gen Viert, o Ca - tho - lijk: Dat ghy Godt mooght be -
- ha - gen, En win - nen 't he - mel - rijck.

The first system of the musical score is enclosed in a purple border. It consists of two staves of music in G-clef and C-clef, with a key signature of one sharp (F#). The lyrics are written below the staves.

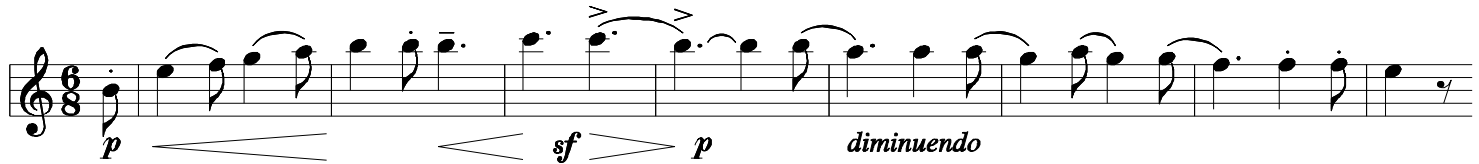
The second system of the musical score is enclosed in a green border. It consists of a single staff of music in G-clef and C-clef, with a key signature of one sharp (F#). The lyrics continue from the first system.

The third system of the musical score is enclosed in a yellow border. It consists of a single staff of music in G-clef and C-clef, with a key signature of one sharp (F#). The lyrics continue from the first system.

The fourth system of the musical score is enclosed in a red border. It consists of three staves of music in G-clef and C-clef, with a key signature of one sharp (F#). The lyrics continue from the first system.

Same melody, other social contexts

- ▶ Dance of Mantua as Dvorak's "Moldau" theme



- ▶ As "Hatikva" (Israeli national anthem)



What makes “same” melodies recognizable?

- ▶ Meter (except compound adaptations)
 - ▶ Especially rhythmic patterns associated with particular dance steps
 - Residues of motor memory?
- ▶ Mode usually (not always) preserved
 - ▶ Are major > minor equivalent to minor > major?
- ▶ Social convention
 - ▶ Properties external to music itself

Websites for literature on similarity

- ▶ www.ismir.net Proceedings for individuals years can be downloaded
- ▶ Psychinfo [lib.stanford.edu databases]
- ▶ RILM [lib.stanford.edu databases]
- ▶ OR searchworks.stanford.edu