

Score semantics: textures, tracks, structural cues

Music 253/CS 275A

Stanford University

Textural types

- Ensemble texture



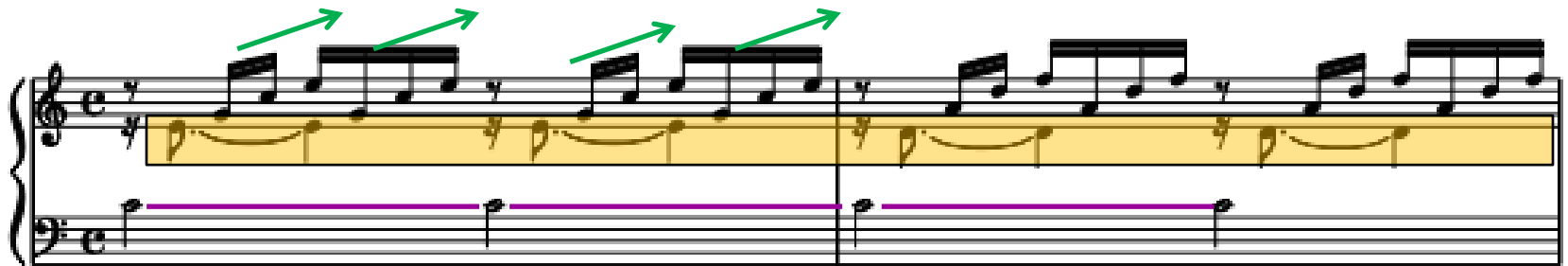
- Keyboard texture



Beyond MIDI core examples

Performance: Arpeggiation and tracks in harpsichord, piano, and lute music

- How many voices?
- When?

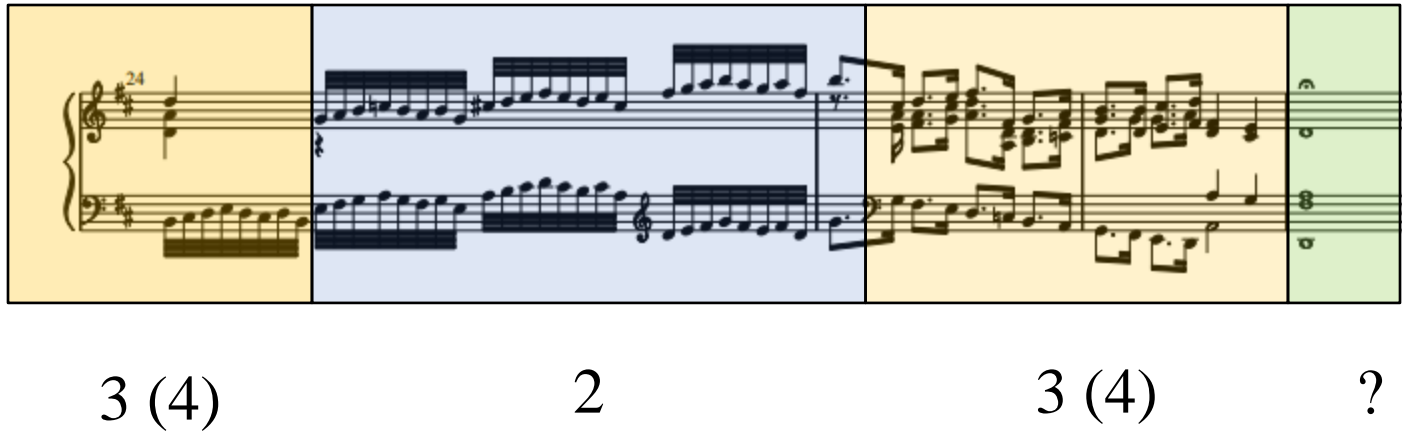


Bach: WTC I, C-Major Prelude: “plucked” arpeggios

One person’s cognitive “chord” is
someone else’s running 8th/16th-note passage,
Or “broken chord” lines

Encoding: Tracks in harpsichord music

- How many voices?
- Number of voices controls “volume”



The image shows a musical score for a harpsichord piece, divided into four distinct sections, each with a different background color. The first section is yellow and contains a single measure with a treble clef and a key signature of one sharp (F#). The second section is blue and contains two measures of music. The third section is orange and contains two measures of music. The fourth section is green and contains a single measure of music. Below each section is a number indicating the number of voices: 3 (4), 2, 3 (4), and ?.

3 (4) 2 3 (4) ?

Bach: WTC I, D-Major Fugue

Well-behaved tracks (organ)



Bach: four-voice chorale

Tracks in piano music

Harp-like
passage

The image displays three systems of musical notation for a piano piece. The first system is highlighted with a yellow background and is labeled '19.' and 'Allegro comodo.' It features a treble and bass staff with a harp-like passage in the right hand, marked with a 'p' (piano) dynamic and a '*' symbol. The second system continues the piece with a treble and bass staff, featuring a 'cre - scen - do' vocal line in the right hand, marked with a 'ff' (fortissimo) dynamic and a '*' symbol. The third system is marked 'assai allegro' and features a treble and bass staff with a rapid, ascending and descending scale-like passage in the right hand, marked with a 'ff' dynamic and a '*' symbol.

Hummel: Prelude No. 19

Tracks in piano music: varying textures

The image displays a musical score for Chopin's Mazurka, Op. 67, No. 1, divided into three distinct sections labeled 2, 3, and 4. Each section is highlighted with a different background color: yellow for section 2, green for section 3, and blue for section 4. The score is written for piano (p) and features a treble and bass clef. Section 2 (yellow) begins with a treble clef and a key signature of one sharp (F#), showing a melodic line in the right hand and a supporting bass line in the left hand. Section 3 (green) continues the melodic development with a key signature change to two sharps (F# and C#). Section 4 (blue) features a key signature change to two sharps (F# and C#) and includes a trill in the right hand. The sections are separated by vertical lines, and the labels 2, 3, and 4 are centered below each respective section.

Chopin: Mazurka, Op. 67, No. 1

Braille score typologies

- Ensemble texture =
“open score”



- Keyboard texture =
“bar over bar”

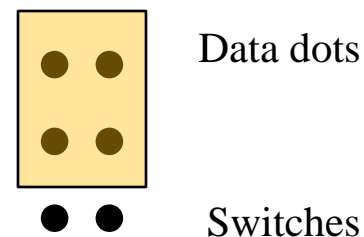
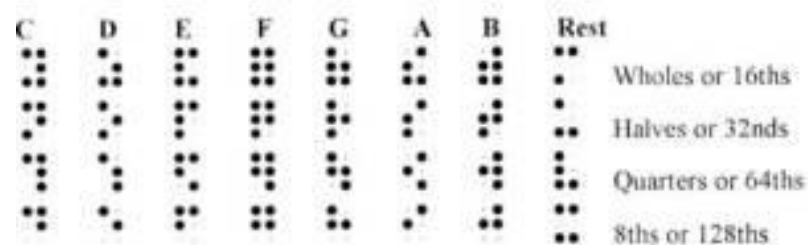


Braille MN: score types

- **Bar-over-bar**: piano music
- **Open-score**: intended for sight-singing
- *Short-score*: choral analogue of bar-over-bar
- *Section-by-section*: piano music or score
- *Single-line*: single instrumental part

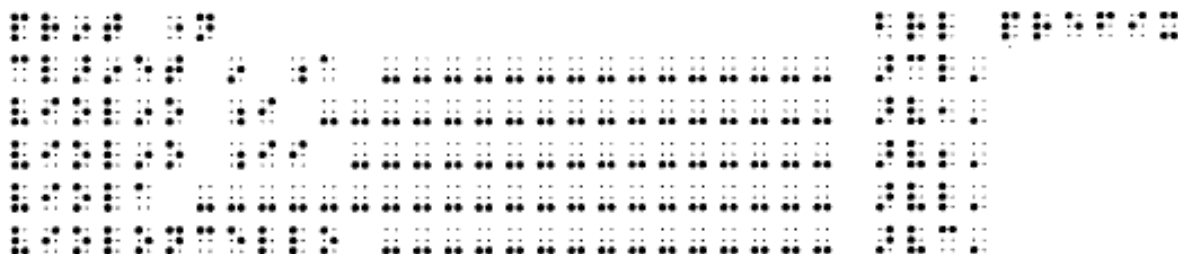
Braille music codes (in general)

- Braille MN developed in c. 1850
- **Six-dot cell**
- Many symbols redefined by context
- Has national dialects
- Has international governing body
- Dependent on impact printing

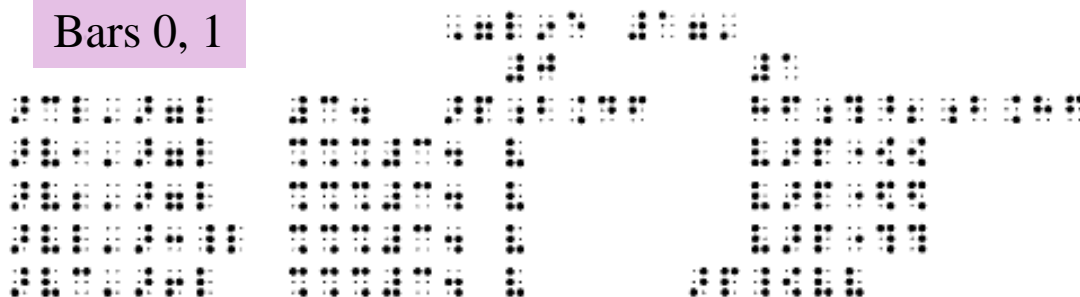


Braille: Mozart trio encoding (clarinet only)

Setup data



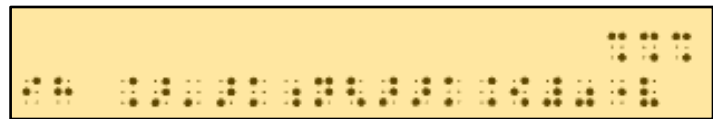
Bars 0, 1



Mozart “Turkish March” in Braille MN



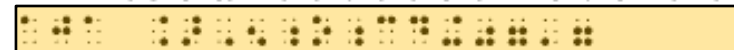
Bar 89



Bar 90



Bar 91



Bar 92



R.H.

Mozart “Turkish” March: domain dissection

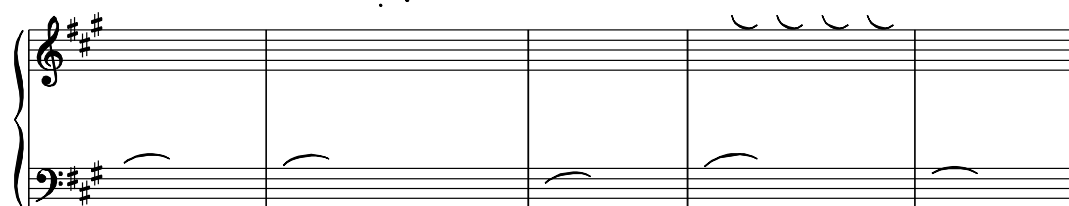


MIDI (pitch) data



Slurs

Slur orientations



Beams

Beam slopes*

Beam lengths*



Musical structure: Notation-sound conflicts

Score structure

- Da capos
- 1st, 2nd endings
- Upbeat complements

Notation>sound
translation

Sound specs precise,
Graphics specs free to modify

Sound file structure

- Recap point?
- Repeats happen **or not***
- 2nd endings with transitions
may not **compute****

* affects total number of bars

** where 1st time has upbeat,
repeat point has downbeat

Encoding transposing instruments

The image displays a musical score for a string quartet and a clarinet in A. The score is written for five staves: Clarinet in A, Violino I, Violino II, Viola, and Violoncello. The key signature is A major (three sharps: F#, C#, G#). The time signature is 4/4. The first system shows the Clarinet in A playing a melodic line, while the strings provide harmonic support. The second system shows a double bar line, after which the strings play a sustained chord, and the Clarinet in A continues its melodic line. The score is presented in a clean, professional layout with clear notation and staff labels.

- MIDI: sounding pitch
Clarinet in A
- Score/part: written pitch
Strings in A Major
Clarinet in C Major

An application: Textures and tracks in AI-assisted OMR (Alicante group)

- Jorge Calvo-Zaragosa, Jan Hajič, jr., Alexander Pacha
- Reconceptualization
- Introduction of neural nets (NN)
- Goal: end-to-end applications for specific notational types (CMN, monophony, mensural music, keyboard)
 - **Musical semantics**
 - **Musical notation**

Calvo-Zaragoza, Hajič, Pacha, et al.: Inputs/output clarified in papers

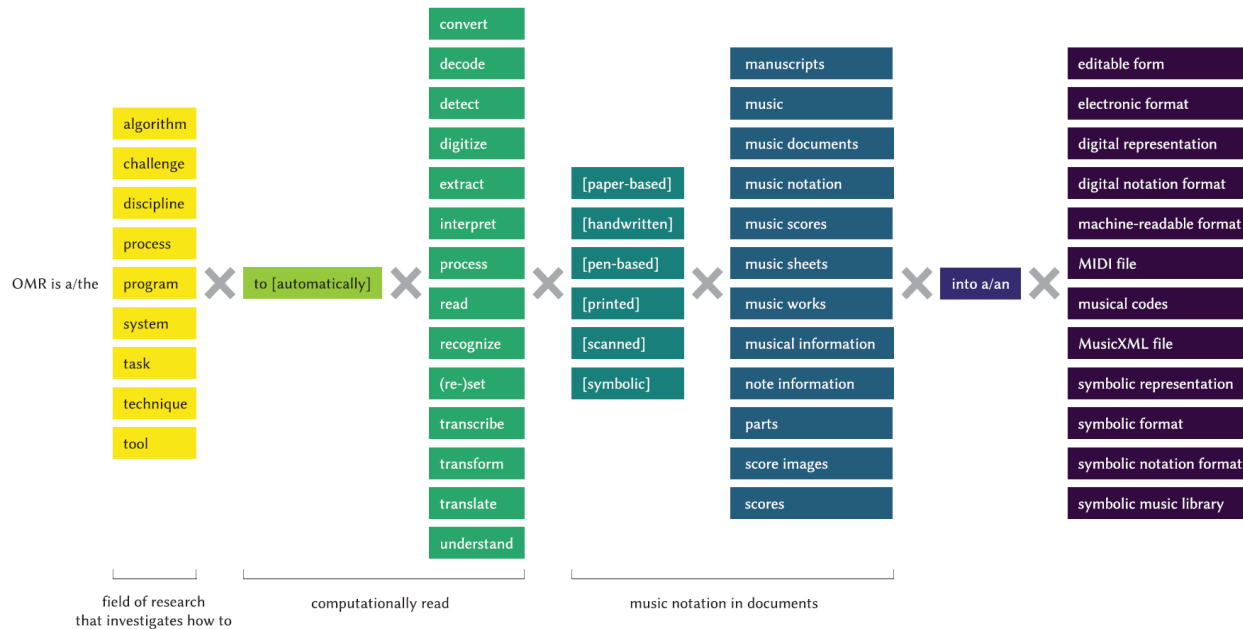


Fig. 1. How OMR tends to be defined or described and how our proposed definition relates to it. For example: “OMR is the challenge of (automatically) converting (handwritten) scores into a digital representation.”

ACM Reference format:

Jorge Calvo-Zaragoza, Jan Hajič Jr., and Alexander Pacha. 2020. Understanding Optical Music Recognition. *ACM Comput. Surv.* 53, 4, Article 77 (July 2020), 35 pages.

<https://doi.org/10.1145/3397499>

Same notes, different levels of legibility/semantics/comprehension

How does the eye find the melody?

M. M. ♩ = 108

3 5

4 5 4 3

3 5

4

And.

(a)

3

3

3

3

3

3

3

3

(b)

Alicante group:

Four categories of “structural complexity”



(a) Monophonic



(b) Homophonic



(c) Polyphonic



(d) Pianoform

“Pianoform” semantics

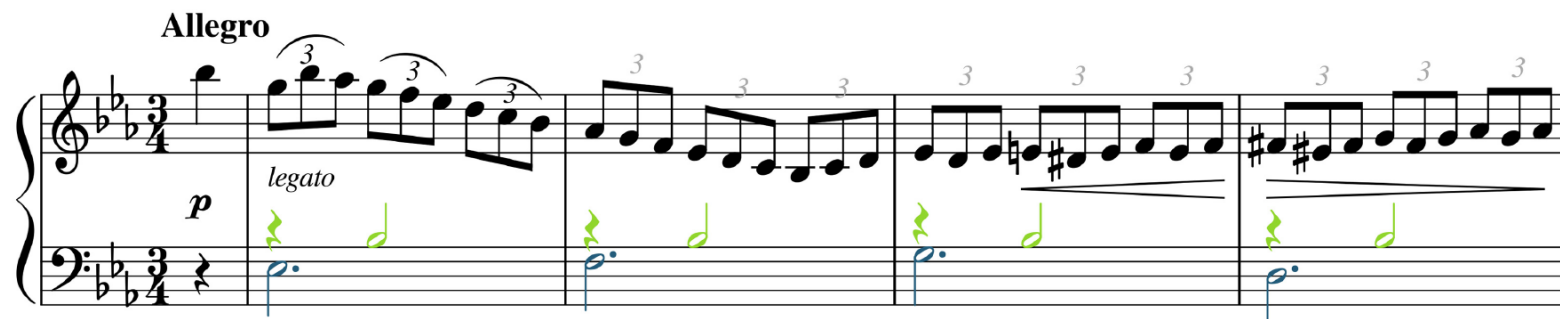
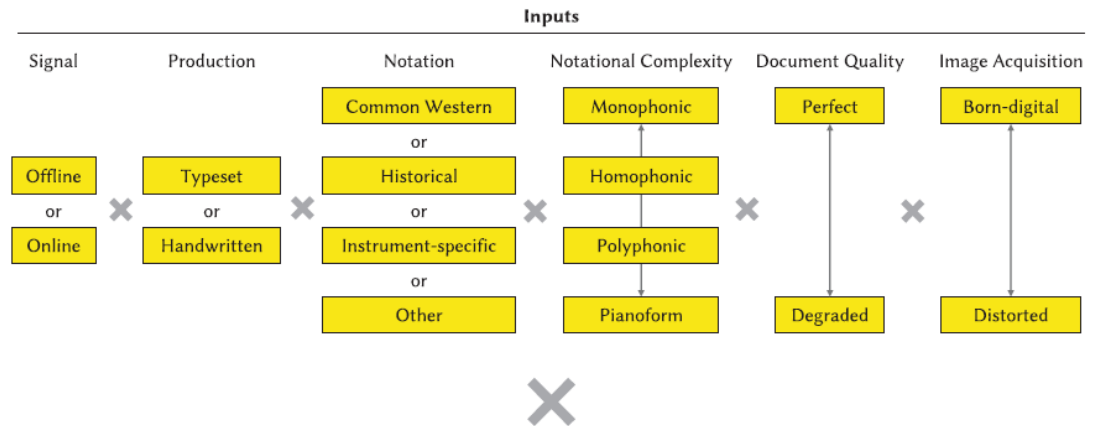


Fig. 14. Beginning of Franz Schubert, Impromptu D. 899, No. 2. The triplet marks starting in the second measure of the top staff are typically omitted in printed editions (here depicted in gray for visualization). The two distinct voices in the bottom staff are color-coded in green and blue.

A clearer model of score semantics



Understanding Optical Music Recognition

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